

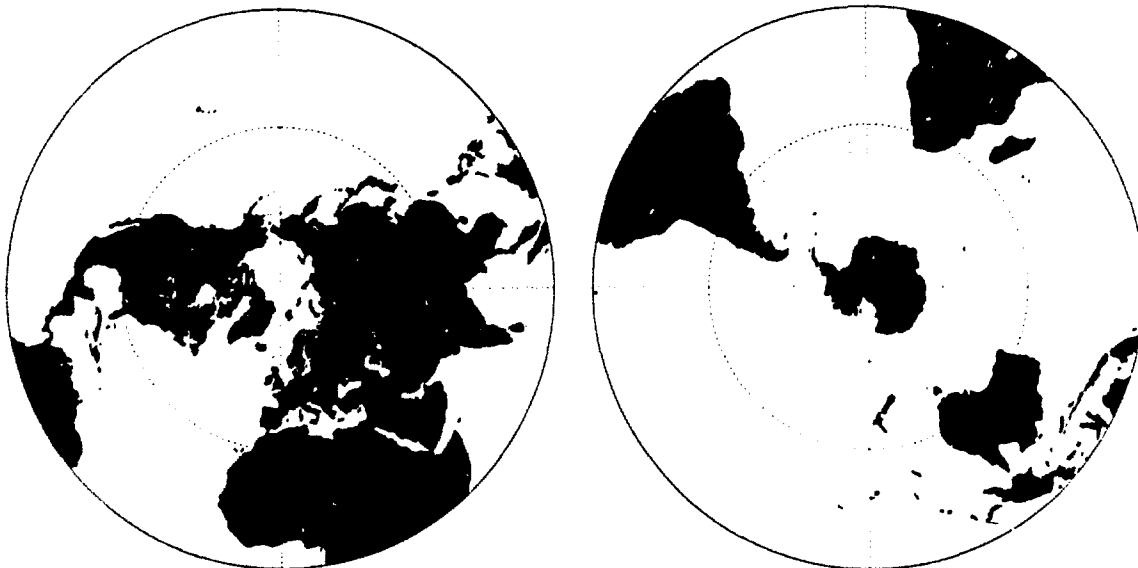
①
NAVAIR 50-1C-10
AWS/TR-89/010

JOINT U.S. NAVY/U.S. AIR FORCE CLIMATIC STUDY OF THE UPPER ATMOSPHERE

VOLUME 10 - OCTOBER

JULY, 1989

AD-227 127



PREPARED BY
NAVAL OCEANOGRAPHY COMMAND DETACHMENT
ASHEVILLE, N.C.

PREPARED UNDER THE AUTHORITY OF
COMMANDER, NAVAL OCEANOGRAPHY COMMAND
STENNIS SPACE CENTER, MS 39529-5000

DTIC
ELECTED
OCT 04 1990
S E D



DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

80 10 03 096

0850LP0159500

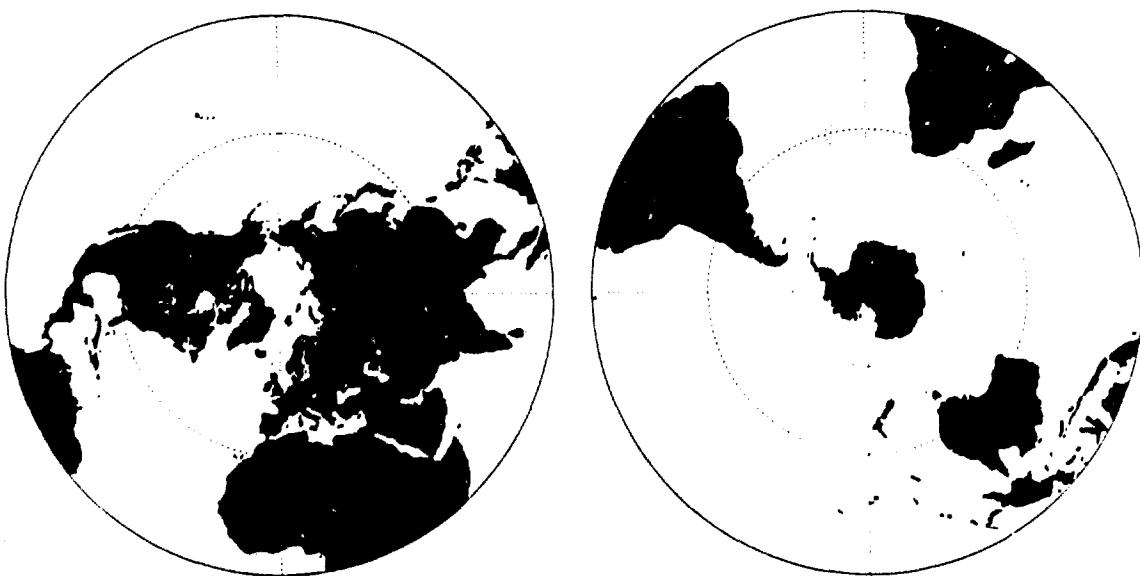


NAVAIR 50-1C-10

JOINT U.S. NAVY/U.S. AIR FORCE CLIMATIC STUDY OF THE UPPER ATMOSPHERE

VOLUME 10 - OCTOBER

JULY, 1989



PREPARED BY
NAVAL OCEANOGRAPHY COMMAND DETACHMENT
ASHEVILLE, N.C.

PREPARED UNDER THE AUTHORITY OF
COMMANDER, NAVAL OCEANOGRAPHY COMMAND
STENNIS SPACE CENTER, MS 39529-5000

DTIC
ELECTED
OCT 04 1990
S E D



DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

90 10 03 096

0850LP0159500



NMWP 50-1C-10

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE			
1a REPORT SECURITY CLASSIFICATION Unclassified	1b RESTRICTIVE MARKINGS		
2a SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT Public Release/Distribution Unlimited		
2b DECLASSIFICATION/DOWNGRADING SCHEDULE			
4 PERFORMING ORGANIZATION REPORT NUMBER(S)		5 MONITORING ORGANIZATION REPORT NUMBER(S) NAVAIR 50-1C-10 S/N 0850-LP-015-9500, AWS/TR-89/010	
6a NAME OF PERFORMING ORGANIZATION National Climatic Data Center Global Analysis Branch	6b OFFICE SYMBOL E/CC22	7a NAME OF MONITORING ORGANIZATION Naval Oceanography Command Detachment Asheville	
6c ADDRESS (City, State, and ZIP Code) Federal Building Asheville, NC 28801-2696		7b. ADDRESS (City, State, and ZIP Code) Federal Building Asheville, NC 28801-2696	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Commander, Naval Oceanography Command Headquarters, Air Weather Service		9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c ADDRESS (City, State, and ZIP Code) Stennis Space Center, MS 39529-5000 Scott AFB, IL 62225-5008		10 SOURCE OF FUNDING NUMBERS	
PROGRAM ELEMENT NO	PROJECT NO	TASK NO	WORK UNIT ACCESSION NO
11 TITLE (Include Security Classification) Joint U.S. Navy/U.S. Air Force Climatic Study of the Upper Atmosphere Volume 10-October			
12 PERSONAL AUTHOR(S) NCDC - Michael J. Changery, Claude N. Williams NAVOCEANCOMDET - Michael L. Dickenson, Brian L. Wallace			
13a TYPE OF REPORT Final	13b TIME COVERED FROM _____ TO _____	14 DATE OF REPORT (Year, Month, Day) July 1989	15 PAGE COUNT 236
16 SUPPLEMENTARY NOTATION			
17 COSATI CODES		18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	
19 ABSTRACT (Continue on reverse if necessary and identify by block number)			
<p>This study of the upper atmosphere is based on 1980-85 twice daily gridded analysis produced by the European Centre for Medium Range Weather Forecasts. Included are global analyses of (1) Mean Temperature/Standard Deviation, (2) Mean Geopotential Height/Standard Deviation, (3) Mean Density/Standard Deviation, (4) Height and Vector Standard Deviation. All for 13 pressure levels - 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30 mb. In addition, analyses of (5) Mean Dew Point/Standard Deviation - levels 1000 through 300 mb, (6) jet stream (mean scalar speed) - levels 500 through 30 mb. Also included are global 5 degree grid point wind roses for the 13 pressure levels.</p>			
20 DISTRIBUTION/AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a NAME OF RESPONSIBLE INDIVIDUAL Brian L. Wallace		22b TELEPHONE (Include Area Code) (704) 252-7865	22c. OFFICE SYMBOL

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted.

All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

TABLE OF CONTENTS

	PAGE
INTRODUCTION	iv
REFERENCES	vii
ELEMENTS	
PRESSURE-HEIGHT.	1-27
WIND ROSE.	29-107
JET STREAM	109-129
TEMPERATURE.	131-157
DEW POINT.	159-171
DENSITY.	173-199
HEIGHT/WIND STANDARD DEVIATION	201-227

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification _____	
By _____	
Distribution/ _____	
Availability Codes	
Dist	Avail and/or Special
A-1	

The Joint U.S. Navy/U.S. Air Force Climatic Study of the Upper Atmosphere was prepared by the Officer in Charge, Naval Oceanography Command Detachment, Asheville, North Carolina under the authority of Commander, Naval Oceanography Command. Additional funding was provided by the Air Weather Service as a result of Tri-Services Climatology initiatives. The work was performed at the National Climatic Data Center (NCDC). Specific acknowledgement of the NCDC staff is made to Mr. M.J. Changery, project leader; Mr. C.N. Williams, Jr. for data processing and software development; and Messrs. M.G. Burgin and D.A. McKittrick for drafting skills. Special acknowledgement is made to the European Centre for Medium-range Weather Forecasts for providing the basic gridded analyses.

INTRODUCTION

During the past decade, improvements in the collection and assimilation of data required for more accurate representations of the atmosphere have resulted in data sets useful for developing a more definitive climatology of the global atmosphere. Such a climatology has uses in aircraft operations and planning, indirect assessments of atmospheric transport as well as a standard state from which atmospheric anomalies can be analyzed.

Prior climatologies, U.S. Navy (1959), U.S. Navy (1966), Naval Weather Service Command (1969), and Naval Weather Service Command (1970), were produced from individual station data with varying periods of record, and the resulting summarized data were analyzed. A serious deficiency was the lack of reporting locations in the major ocean basins. Analyses over the oceans were derived by extrapolating from known analyses over coastal regions as well as the few island or ocean vessels available. An additional complication was the manually intensive effort required to ensure horizontal and vertical consistency of the data.

With the advent, in the 1970s, of more powerful computers and data collection and assimilation systems, the initial analyses used for input into forecast models had a three-fold advantage over the station analyses utilized in the prior climatologies. First, the data assimilation system utilized a greater variety of information for production of an analysis. The normal array of land-based upper air reporting stations was supplemented by ship-based reporting stations, cloud reports, pilot reports and, most importantly, satellite-derived temperature, moisture and wind data. Consequent analyses more accurately represented the state of the atmosphere at a given observation time. Second, the assimilation system quality-controlled all incoming data and ensured the horizontal and vertical consistency of the resulting analyses. Finally, through the computer-based system, global data were available and archived in grid-point form.

A number of analysis sets produced by various national and international meteorological services were investigated. It is recognized that improvements to the data assimilation and analysis systems occurred within any analysis set produced, and that current analyses more accurately reflect the atmosphere's state than do the earlier analyses. It is also recognized that specific parameter or geographic-based deficiencies exist in all analysis sets. However, the intent of this upper-air climatology effort is the production of analyses to serve the needs of the operational meteorologist. A climatology derived from global analyses achieves this goal. Based on known capabilities and technical reviews of the various systems, as well as recommendations from the professional numerical modeling community, the analyses produced by the European Centre for Medium-range Forecasts were selected for processing.

ECMWF DATA

The European Centre for Medium-range Weather Forecasts (ECMWF) is an international organization established in 1973 and supported by 17 member states. It is responsible for providing global forecasts to the European community. Their data assimilation system consists of multivariate optimal interpolation analysis allowing the incorporation of a variety of observations with differing error characteristics and spatial distributions. A relatively comprehensive coverage of global data is ensured through the data collection schedule. A unique feature of the ECMWF system is the method of grid point analysis. Rather than analyzing individual grid points, varying sized boxes (depending on data density) are created containing groups of grid points. Grid point analysis uses data from within the box as well as adjacent boxes, thereby assuring a consistent analysis between all the grid points.

The system also includes internal quality control which examines the climatological reasonability of incoming data as well as the internal consistency of the data.

In addition, the system utilizes a model initialization process which ensures that harmful gravity waves, caused by imbalances in the analysis, with the potential to create problems in subsequent forecast fields, are suppressed. Through the initialization process, the atmosphere's mass and wind fields are adjusted so that only a portion of the gravity wave balanced by dynamic and physical processes is retained. Further information on the ECMWF system is available in Lorenc (1981), Shaw, et al. (1984), Lonnberg, et al. (1986), and ECMWF (1988).

The resulting initialized analyses are vertically interpolated to these 13 standard pressure levels: 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50, and 30 mb, and include the geopotential height, temperature, and wind for all levels with moisture included for the 1000 through 300 mb levels.

Six years (1980-1985) of individual analysis were obtained from ECMWF on a 2.5° global grid. Although the analyses were permanently archived as spherical harmonic coefficients, ECMWF reconstituted the analyses for use in the data processing. Synoptic analyses at six-hour intervals were received for the six-year period, but only the 00 and 12Z analyses were re-sorted into a grid point sort. Given the quality control performed by ECMWF on collected data and the requirements for horizontal and vertical data consistency imposed by the assimilation system, minimal quality control was performed prior to summarization. Primary quality control was limited to comparison of level data against known/estimated climatological extremes.

The summarized grid point data were objectively analyzed, machine-contoured by parameter and level on polar stereographic (0°-90°N and S) and cylindrical equidistant (0°-60°N and S) projections with resulting contours machine-labeled. In addition, individual wind observations were consolidated into eight 45° segments centered on directions north, northeast, through northwest for display as wind roses on a series of cylindrical equidistant projections.

Since the ECMWF analyses were archived as spectral harmonic coefficients, the grid point reconstitution process provides data for all global 2.5° grid points. This naturally includes (for the 1000 through 700 mb levels) selected grid points at which the land elevations exceed the height of the pressure surface. For these grid points, a blanking program was used to eliminate both contours and grid point wind roses.

ANALYSES

1. Pressure-Height

Grid point geopotential height values (in dekameters) are summarized by month for 13 levels from 1000 mb to 30 mb with solid and dashed contours of mean values presented on pressure height charts. Standard deviation of height is calculated from the individual daily values with contours presented on a separate chart series including the standard deviation of vector mean wind. Local points of highest and lowest pressure are designated with H's and L's on the analyzed charts. Not all pressure centers are enclosed by closed contours. Vector mean wind in 5-knot increments are calculated for selected grid points considered adequate to depict flow for the hemisphere with wind shaft orientation related to specific latitude/longitude lines. Vector mean winds less than 2.5 knots are depicted as a shaft with no barbs. Contours of mean geopotential height and vector mean wind barbs are presented for the northern/southern hemispheres on polar stereographic projection and for 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

2. Wind Roses

Wind roses for 10° grid points from 5° to 85° north and south are presented by month for all levels from 1000 mb to 30 mb. Each hemisphere is divided into three longitudinal zones: 60°W to 60°E, 60°E to 180°E, and 180°W to 60°W. Each rose presents:

- a) Scalar mean speed
- b) Percent frequency of occurrence from each of 8 cardinal point wind directions proportional to shaft length with dots on the shafts representing 5 percentile intervals.
- c) Mean speed for each of the 8 cardinal wind directions rounded to the nearest 5 knots.

Roses for grid points on the 1000 mb through 700 mb level charts are blanked whenever the land elevation exceeds the mean geopotential height of the specified level.

3. Temperature

Grid point temperature data (in °C) are summarized by month for 13 levels from 1000 mb to 30 mb with solid and dashed contours of mean values presented on pressure height charts. Temperature standard deviation derived from the individual observations are shown on the same charts with dotted contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

4. Dew Point

Grid point moisture data were received as mixing ratios for the period through April 19, 1982 and as relative humidity thereafter for the 1000 through 300 mb levels. All moisture data were converted to dew point values. These are summarized by month with solid and dashed contours of mean values presented on pressure height charts. Dew point standard deviation derived from the individual observations are shown on the same charts with dotted contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

5. Density

Grid point density data were computed from the daily values of temperature and pressure from the equation of state in the form

$$\rho = \frac{P}{RT}$$

where ρ is the density, P is the pressure, T is the temperature, and R is the gas constant. Density was computed for moist air through 300 mb and for dry air from 250 mb to 30 mb. Density data (in Kg/m³) are summarized by month for all 13 levels with solid and dashed contours of mean values presented on pressure height charts. Density standard deviation derived from individual observations are shown on the same charts with dotted contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

6. Standard Deviation of Height and Vector Mean Wind

Standard deviation of the height and vector mean wind data presented on the pressure height charts are presented on monthly charts for the 1000 through 30 mb levels. Height standard deviations (in dekameters) are presented as solid contours and vector wind standard deviations (in knots) as dashed contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

7. Jet Stream

Grid point scalar mean wind speed (in knots), as presented by the value in the center of the wind rose octagons, are summarized by month and analyzed for 500 through 30 mb. All speeds exceeding 50 knots are shaded with shading intensity increasing by 25-knot increments. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections.

DATA AVAILABILITY

Monthly summarized grid point data for the period of record for all levels from 1000 through 30 mb have been retained on magnetic tape. Data available, per level, include:

- Number of observations
- Mean zonal wind component and standard deviation
- Mean meridional wind component and standard deviation
- Vector mean wind and standard deviation
- Mean temperature and standard deviation
- Mean dew point (through 300 mb) and standard deviation
- Mean geopotential height and standard deviation
- Mean density and standard deviation
- Mean scalar wind speed and percentage of observations for each designated direction

Similarly summarized data for each half-month of the 1980-85 period are also available on magnetic tape. Summaries can be provided on magnetic media or in listing form by the National Climatic Data Center.

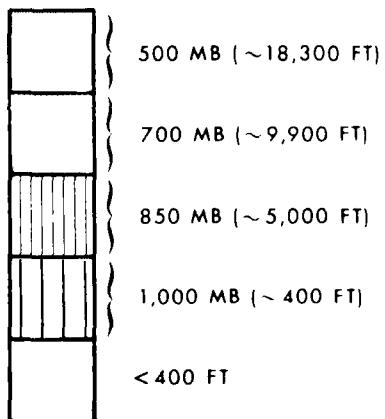
REFERENCES

- ECMWF, 1988: User guide to ECMWF products.
- Lorenc, A.C., 1981: A global three-dimensional multivariate statistical interpretation scheme. Monthly Weather Review, **109**, 701-721.
- Lonnberg, P., J. Pailleux, and A. Hollingsworth, 1986: The new analyses system. ECMWF Technical Memorandum No. 125.
- Naval Weather Service Command, 1969: Climate of the Upper Air - Southern Hemisphere, VOL I, Temperature, Dewpoint and Heights at Selected Pressure Levels, NAVAIR 50-1C-55.
- Naval Weather Service Command, 1970: Selected Level Heights, Temperatures and Dewpoints for the Northern Hemisphere, NAVAIR 50-1C-52.
- Shaw, D.B., P. Lonnberg, and A. Hollingsworth, 1984: The 1984 revision of the ECMWF Analysis System. ECMWF Technical Memorandum, No. 92.
- U.S. Navy, 1959: Upper Wind Statistics Charts of the Northern Hemisphere, VOL I-III, NAVAIR 50-1C-535.
- U.S. Navy, 1966: Components of the 1000 mb Winds of the Northern Hemisphere, NAVAIR 50-1C-51.

PRESSURE - HEIGHT
(13 LEVELS, 1000 TO 30 MB)

- Contours of mean height (solid and dashed lines) in geopotential dekameters; example: 580 is 5800 geopotential meters; solids labeled, dashed intermediates unlabeled
- Height labeled interval:
 - 6 dekameters (60 meters) - 1000 MB to 400 MB
 - 12 dekameters (120 meters) - 300 MB to 200 MB
 - 8 dekameters (80 meters) - 150 MB to 30 MB
- Vector mean wind in knots
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE



Mean Geopotential Height (dkm)

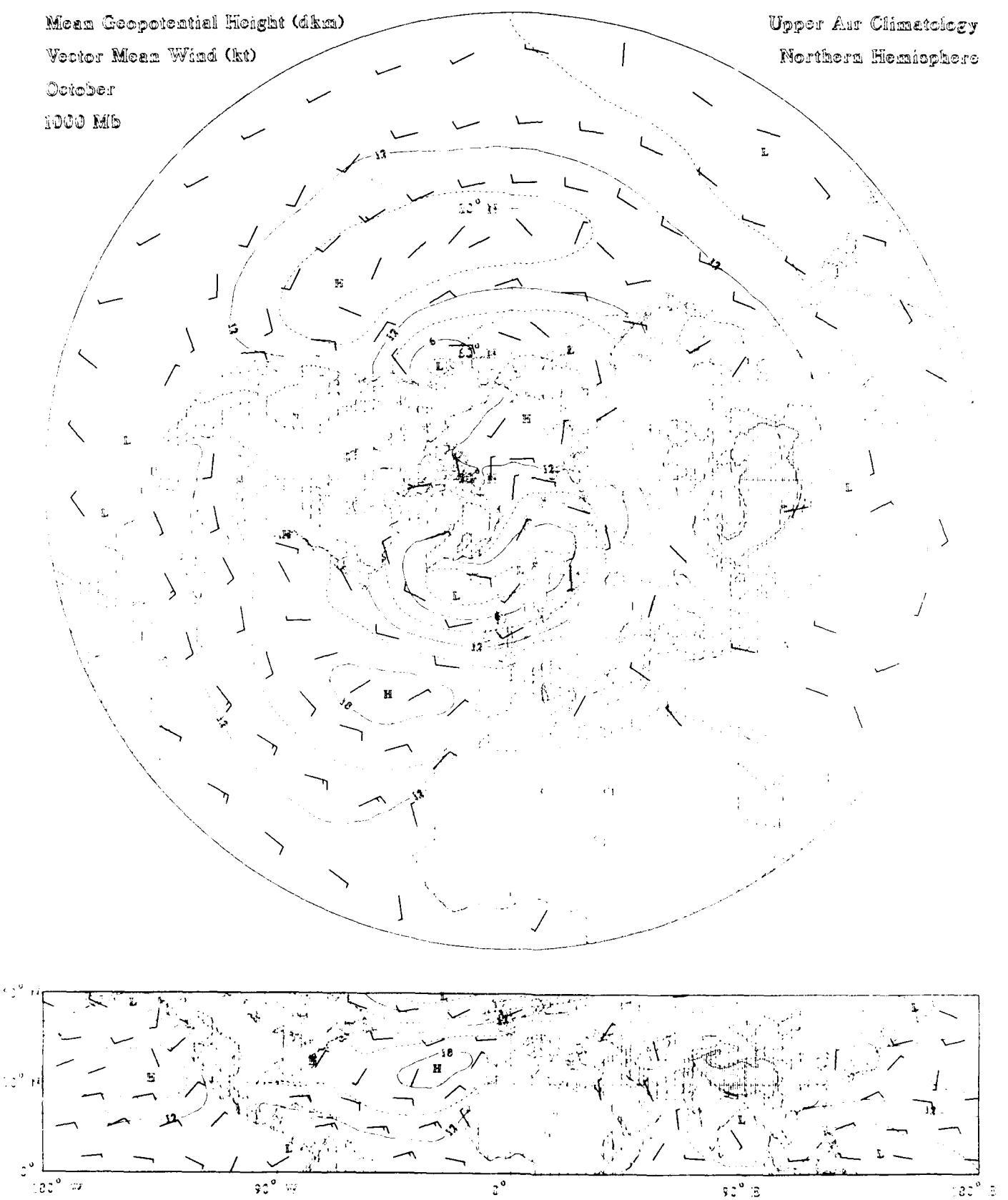
Vector Mean Wind (kt)

October

1000 Mb

Upper Air Climatology

Northern Hemisphere



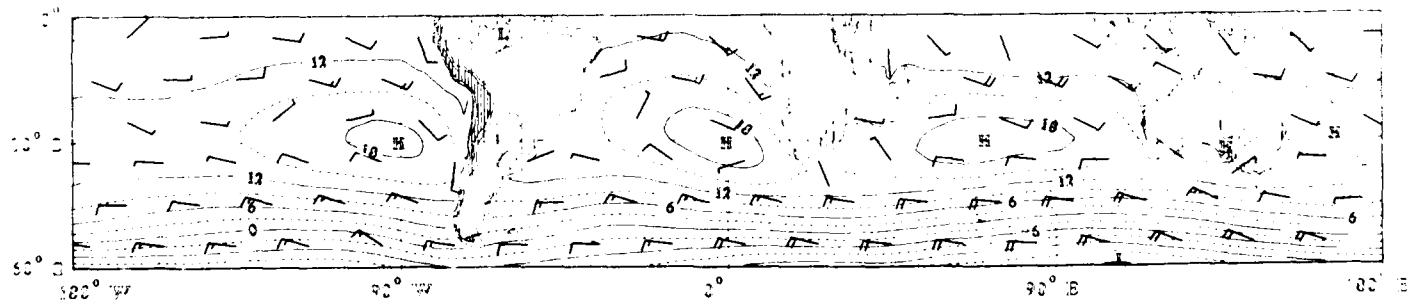
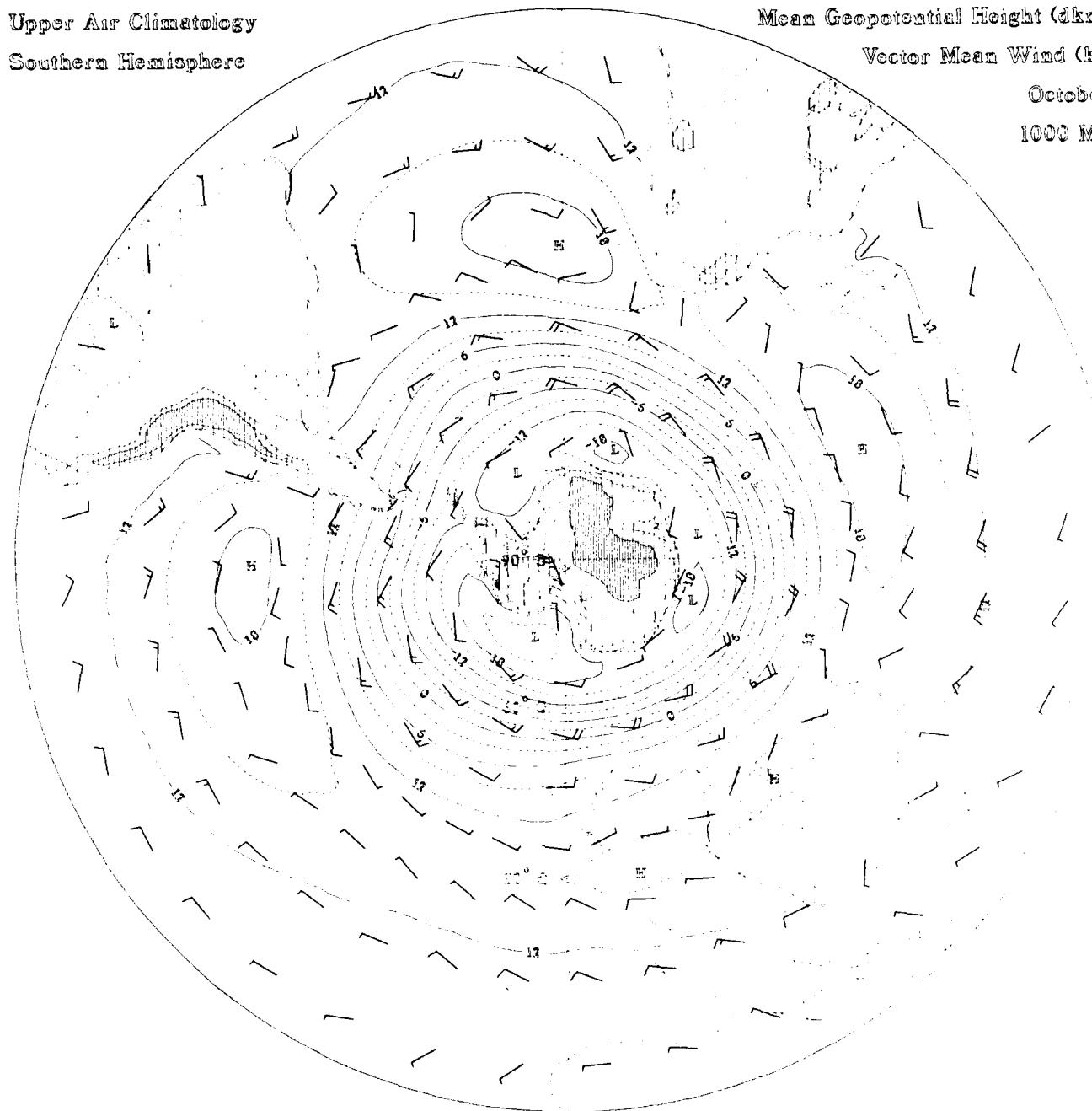
Upper Air Climatology
Southern Hemisphere

Mean Geopotential Height (dkm)

Vector Mean Wind (kt)

October

1000 Mb



Median Depth (meters) - Hogen (contd)

Region: Indian Ocean (Ind)

0° 10' S

30° S

60° S

90° S

120° S

150° S

180° S

210° S

240° S

270° S

30° S

0° N

30° N

60° N

90° N

120° N

150° N

180° N

210° N

240° N

270° N

30° N

0° E

30° E

60° E

90° E

120° E

150° E

180° E

210° E

240° E

270° E

30° E

0° W

30° W

60° W

90° W

120° W

150° W

180° W

210° W

240° W

270° W

30° W

0° N

30° N

60° N

90° N

120° N

150° N

180° N

210° N

240° N

270° N

30° N

0° E

30° E

60° E

90° E

120° E

150° E

180° E

210° E

240° E

270° E

30° E

0° W

30° W

60° W

90° W

120° W

150° W

180° W

210° W

240° W

270° W

30° W

0° N

30° N

60° N

90° N

120° N

150° N

180° N

210° N

240° N

270° N

30° N

0° E

30° E

60° E

90° E

120° E

150° E

180° E

210° E

240° E

270° E

30° E

0° W

30° W

60° W

90° W

120° W

150° W

180° W

210° W

240° W

270° W

30° W

0° N

30° N

60° N

90° N

120° N

150° N

180° N

210° N

240° N

270° N

30° N

0° E

30° E

60° E

90° E

120° E

150° E

180° E

210° E

240° E

270° E

30° E

0° W

30° W

60° W

90° W

120° W

150° W

180° W

210° W

240° W

270° W

30° W

0° N

30° N

60° N

90° N

120° N

150° N

180° N

210° N

240° N

270° N

30° N

0° E

30° E

60° E

90° E

120° E

150° E

180° E

210° E

240° E

270° E

30° E

0° W

30° W

60° W

90° W

120° W

150° N

180° N

210° N

240° N

270° N

30° N

0° E

30° E

60° E

90° E

120° E

150° E

180° E

210° E

240° E

270° E

30° E

0° W

30° W

60° W

90° W

120° W

150° W

180° W

210° W

240° W

270° W

30° W

0° N

30° N

60° N

90° N

120° N

150° N

180° N

210° N

240° N

270° N

30° N

0° E

30° E

60° E

90° E

120° E

150° E

180° E

210° E

240° E

270° E

30° E

0° W

30° W

60° W

90° W

120° W

150° W

180° W

210° W

240° W

270° W

30° W

0° N

30° N

60° N

90° N

120° N

150° N

180° N

210° N

240° N

270° N

30° N

0° E

30° E

60° E

90° E

120° E

150° E

180° E

210° E

240° E

270° E

30° E

0° W

30° W

60° W

90° W

120° W

150° W

180° W

210° W

240° W

270° W

30° W

0° N

30° N

60° N

90° N

120° N

150° N

180° N

210° N

240° N

270° N

30° N

0° E

30° E

60° E

90° E

120° E

150° E

180° E

210° E

240° E

270° E

30° E

0° W

30° W

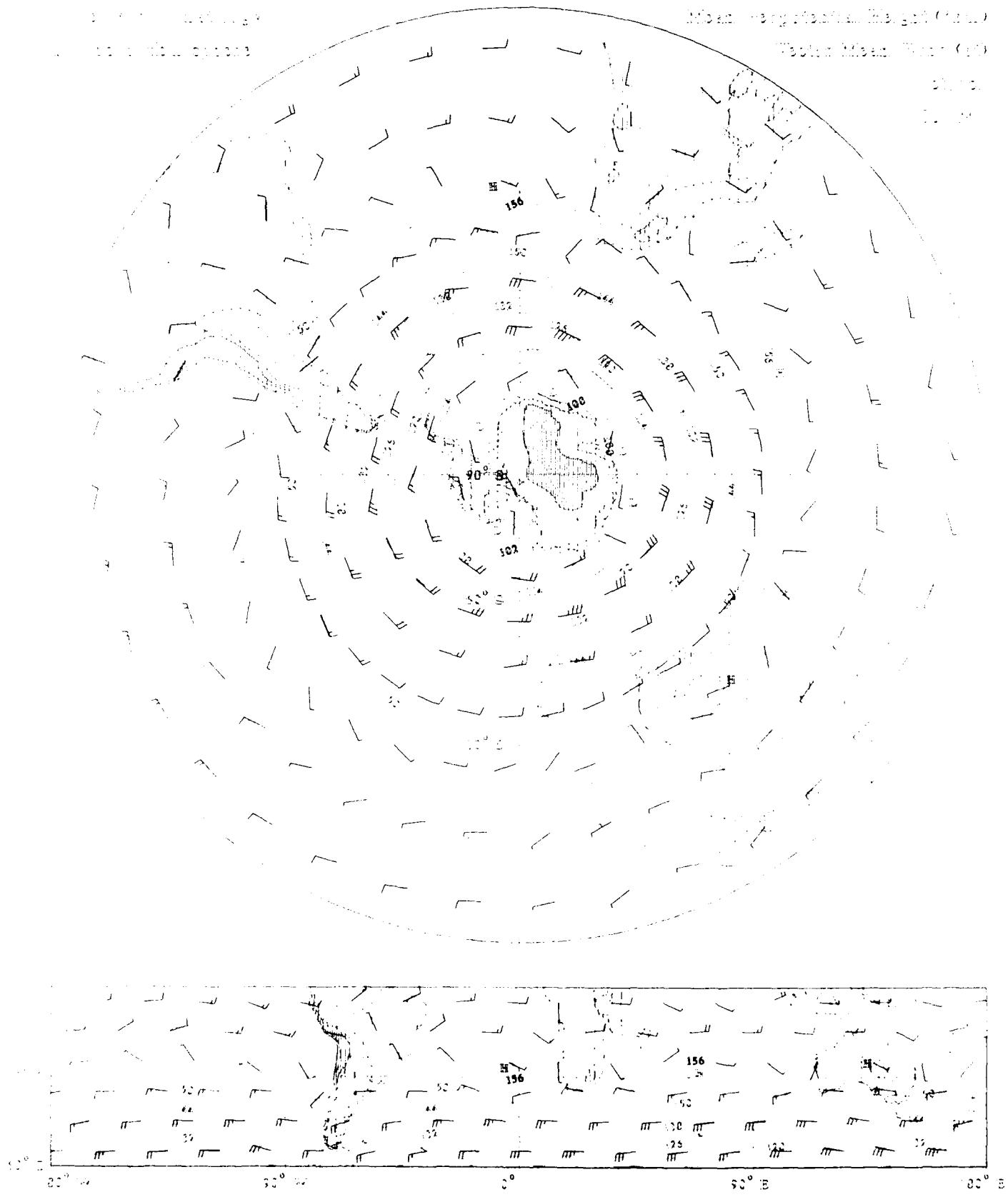
60° W

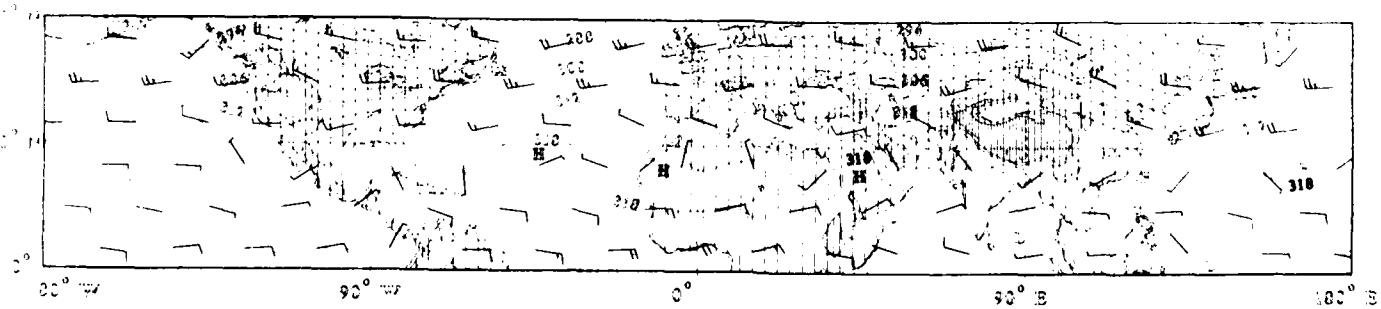
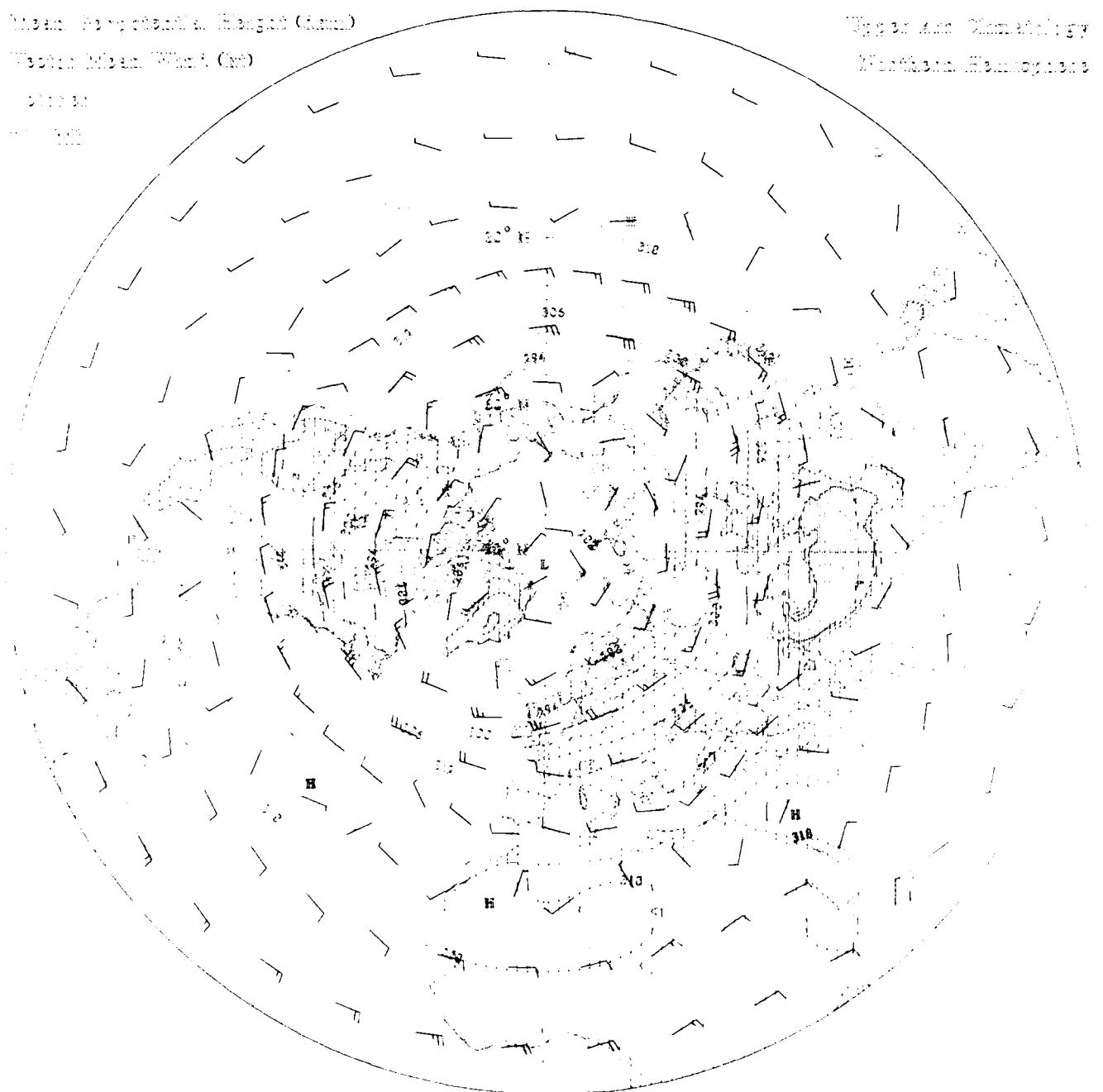
90° W

120° W

150° W

<





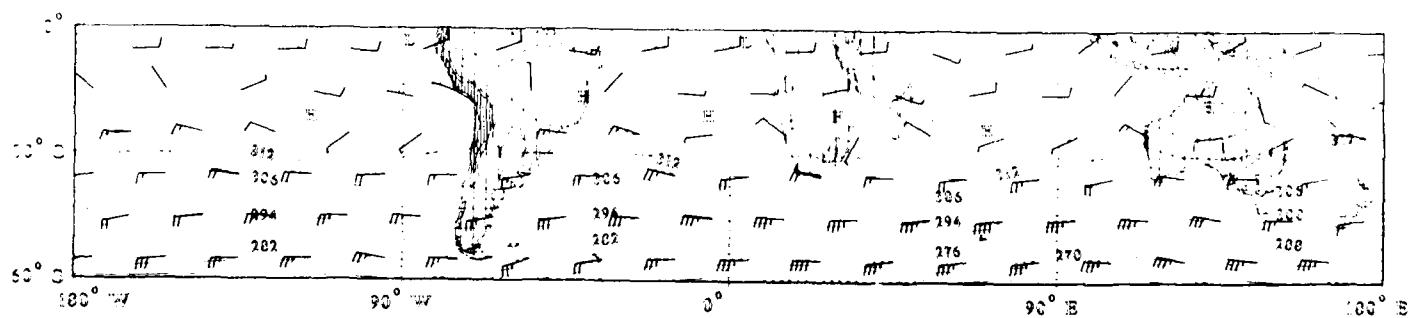
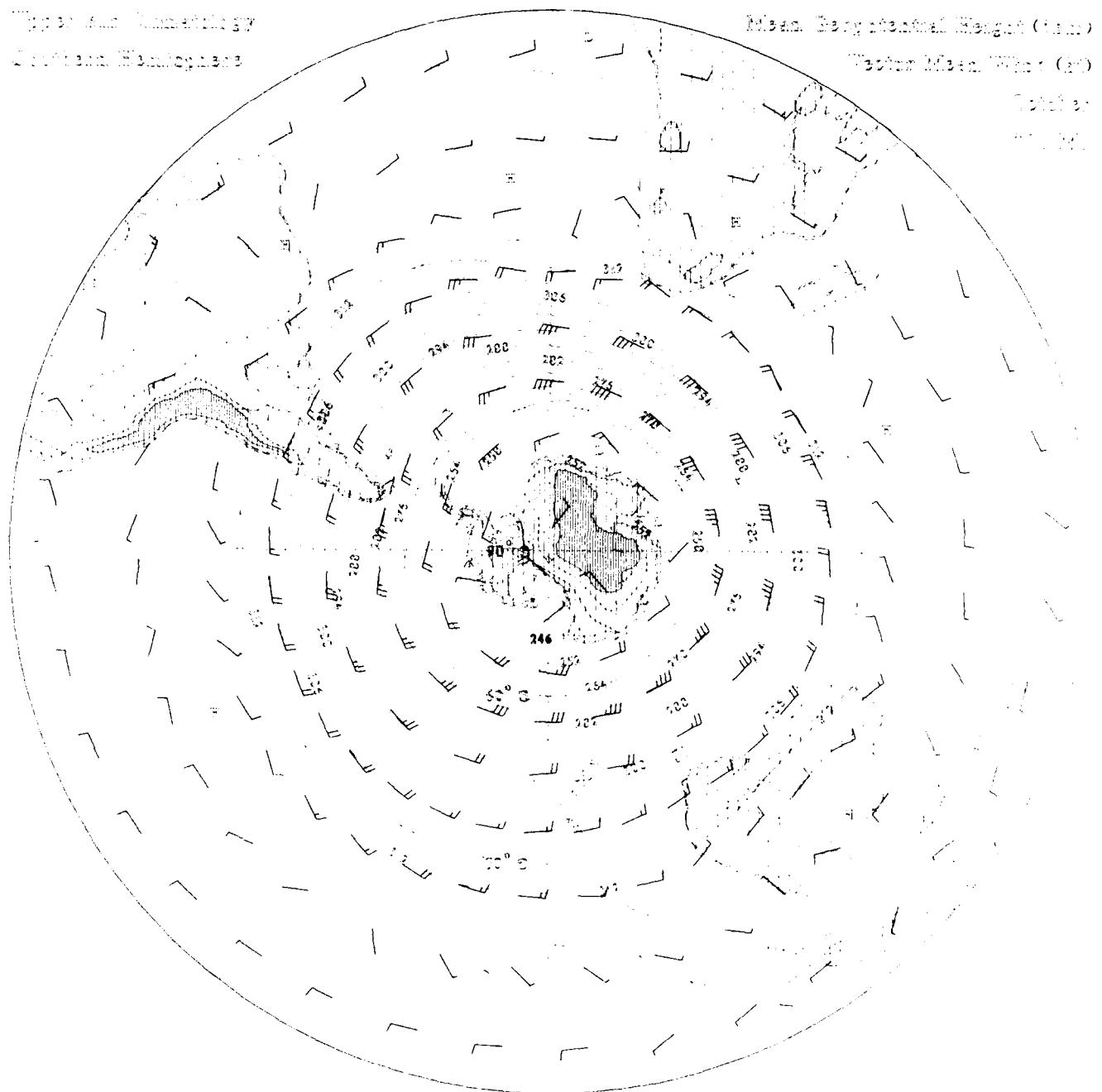
Topographic Map
Central Mongolia

Mean Depth Contour Length (km)

Vector Mean Depth (m)

2000 m

1000 m



Mean Geopotential Height (km)

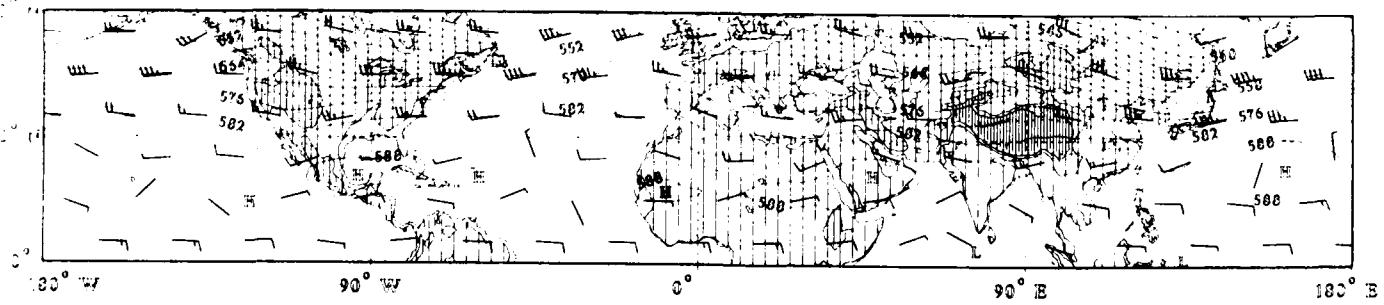
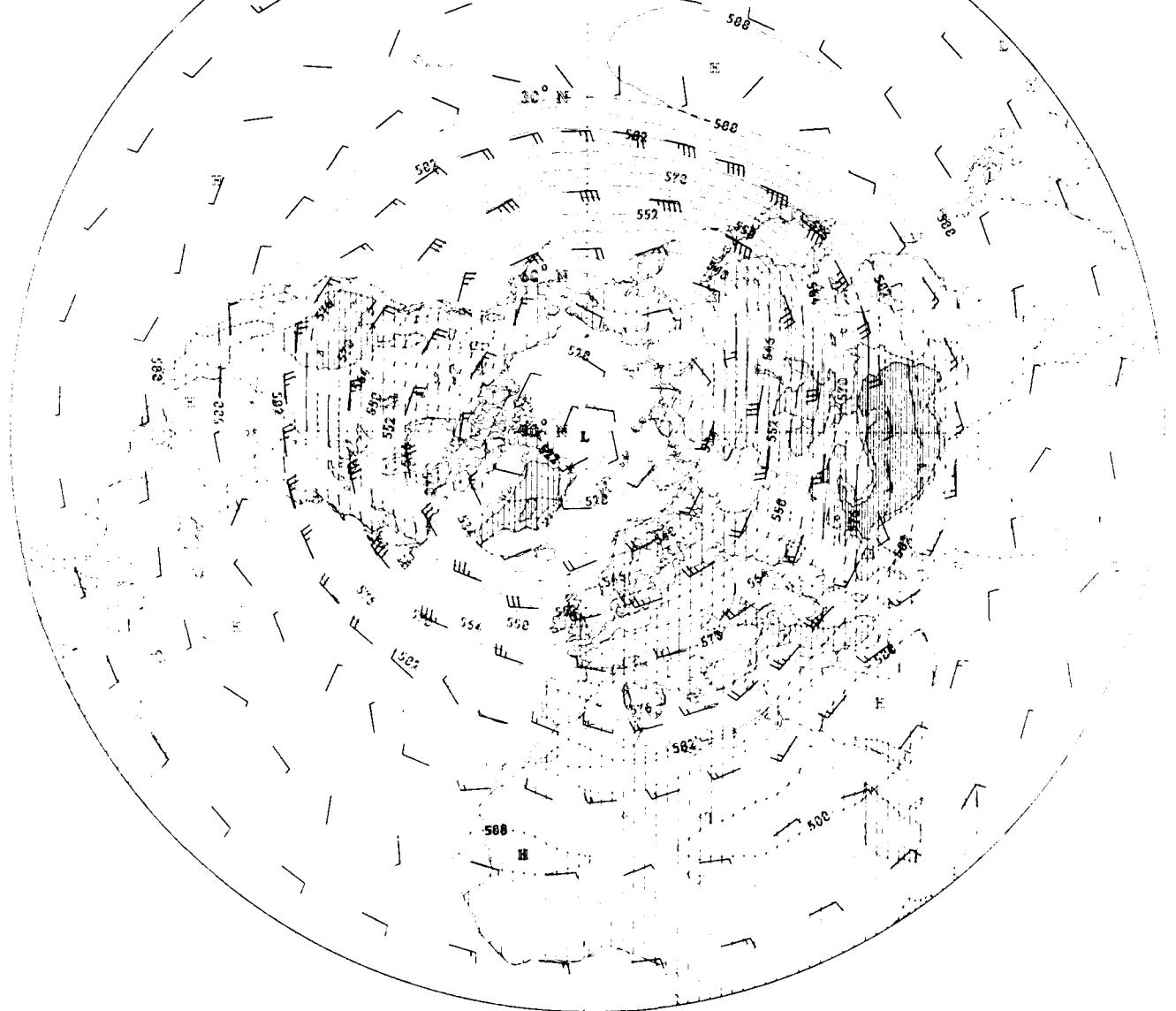
Vector Mean Wind (m)

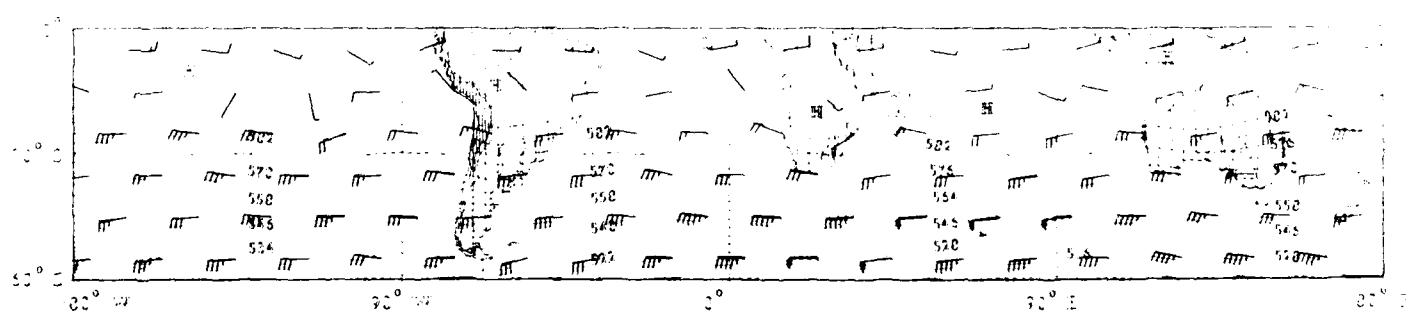
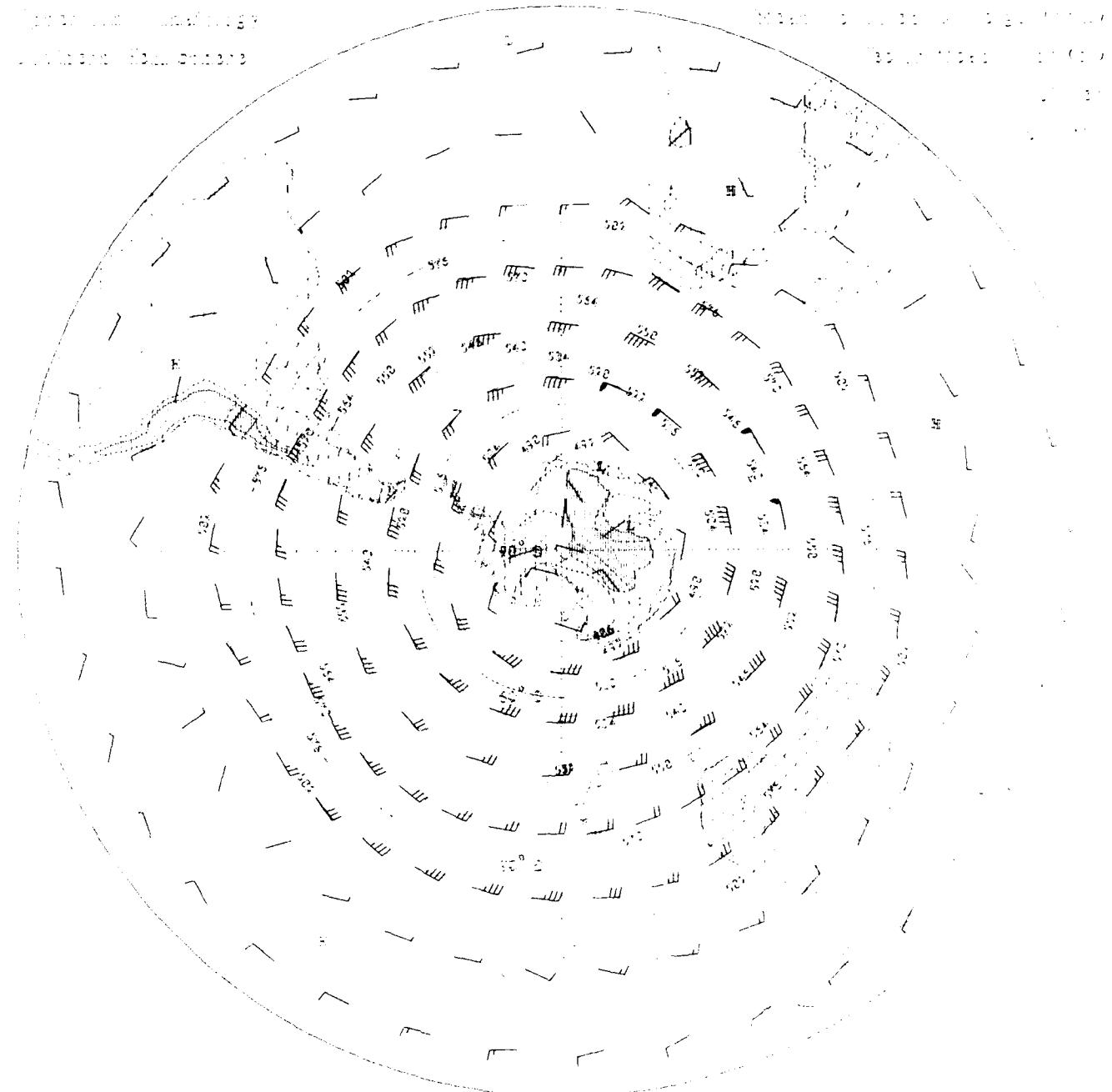
Clouds

Sea Ice

Upper Air Climatology

Northern Hemisphere





Mean Barometric Height (dm)

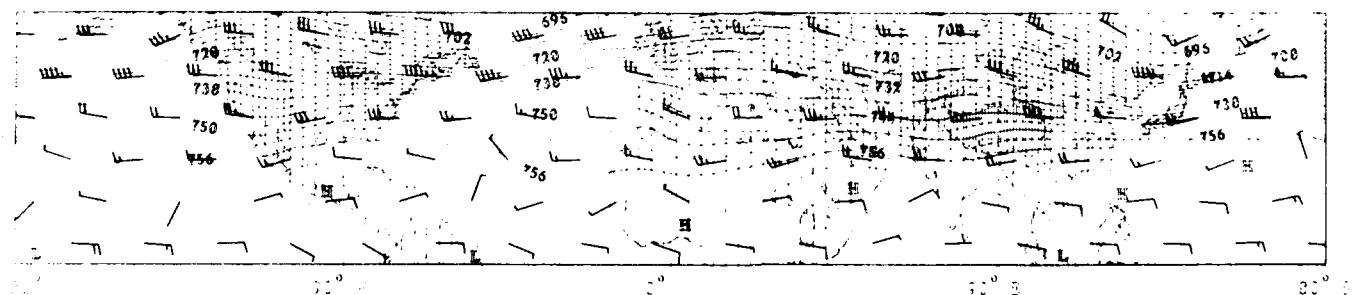
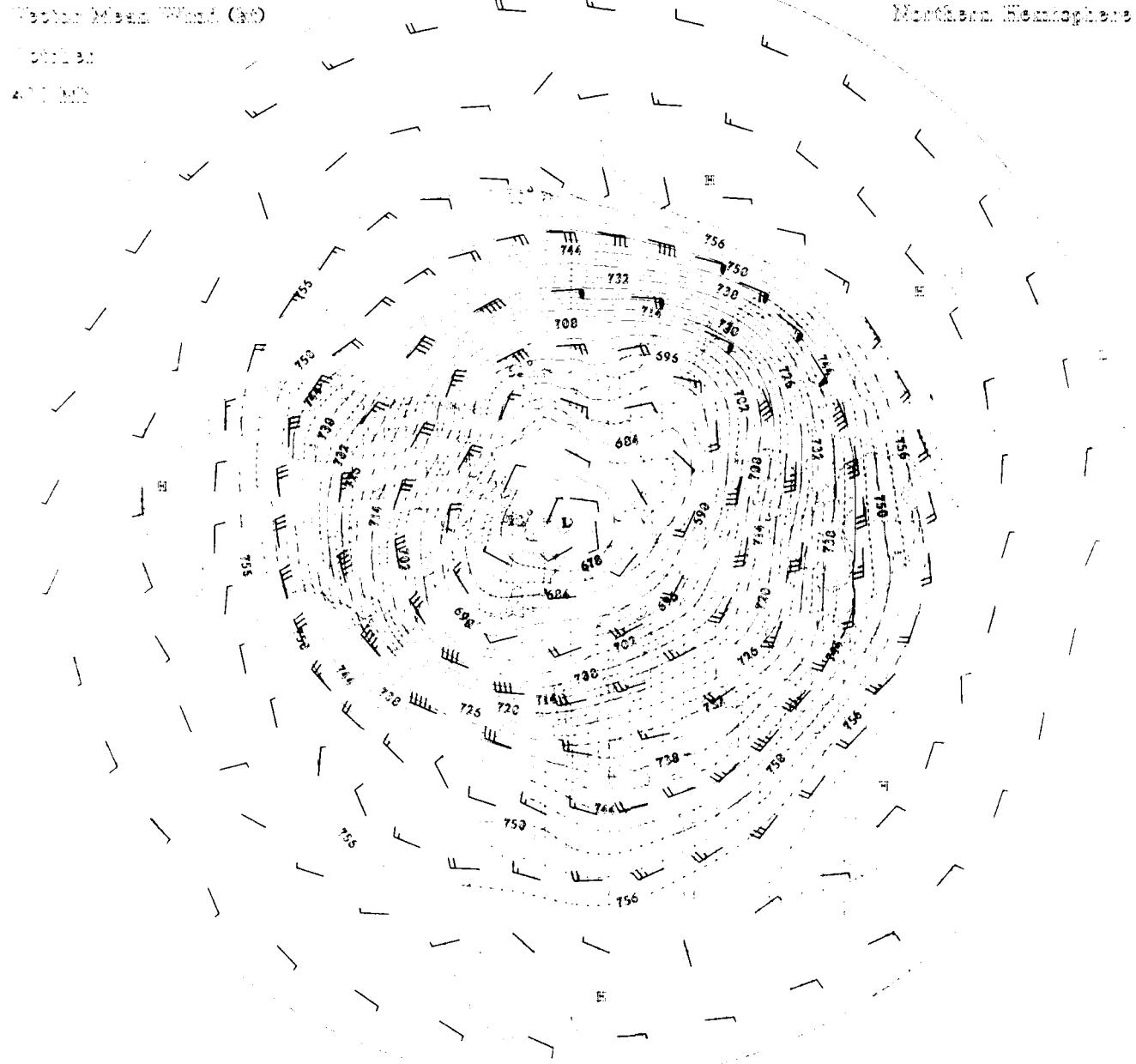
Section Mean Wind (m)

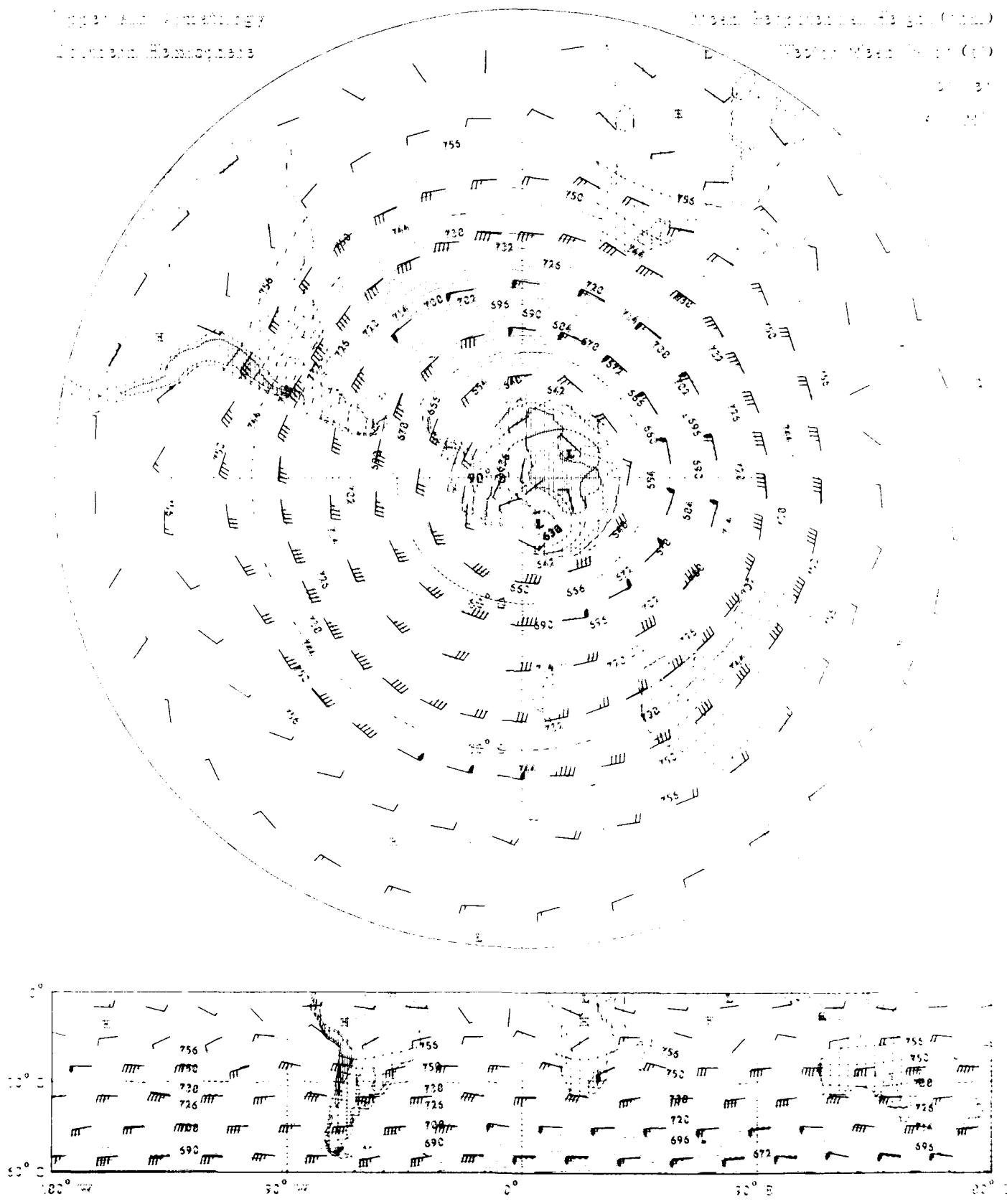
0.0132

2.7 m/s

Japan and Climatology

Northern Hemisphere





Mean Depth of Water (m)

Mean Water Level (m)

Topsoil Water Table

Groundwater Head (m)

0

10

20

30

40

50

60

70

80

90

100

110

120

130

140

150

160

170

180

190

200

210

220

230

240

250

260

270

280

290

300

310

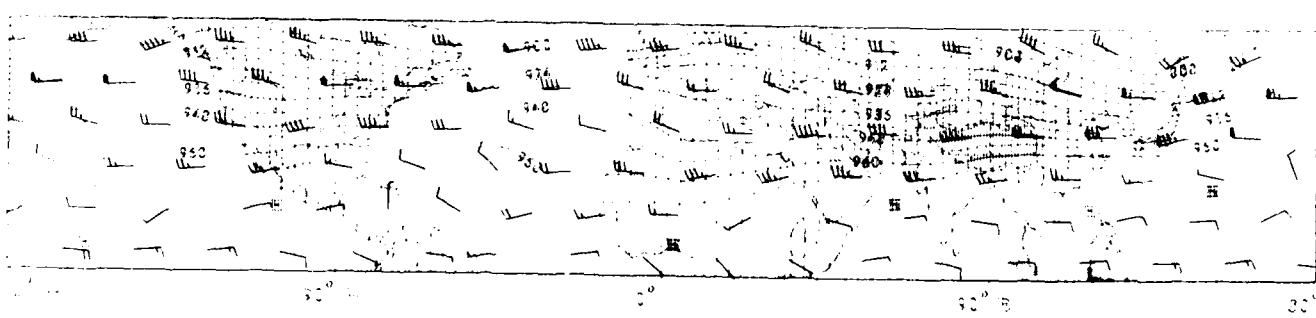
320

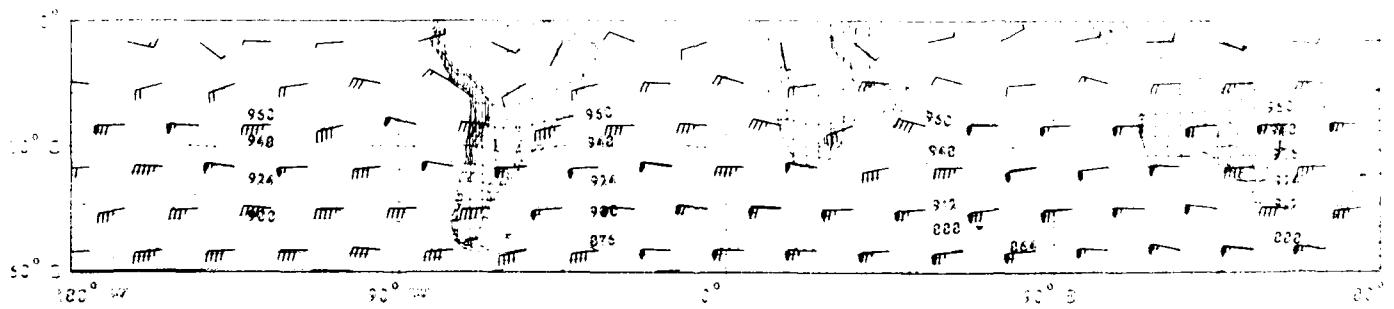
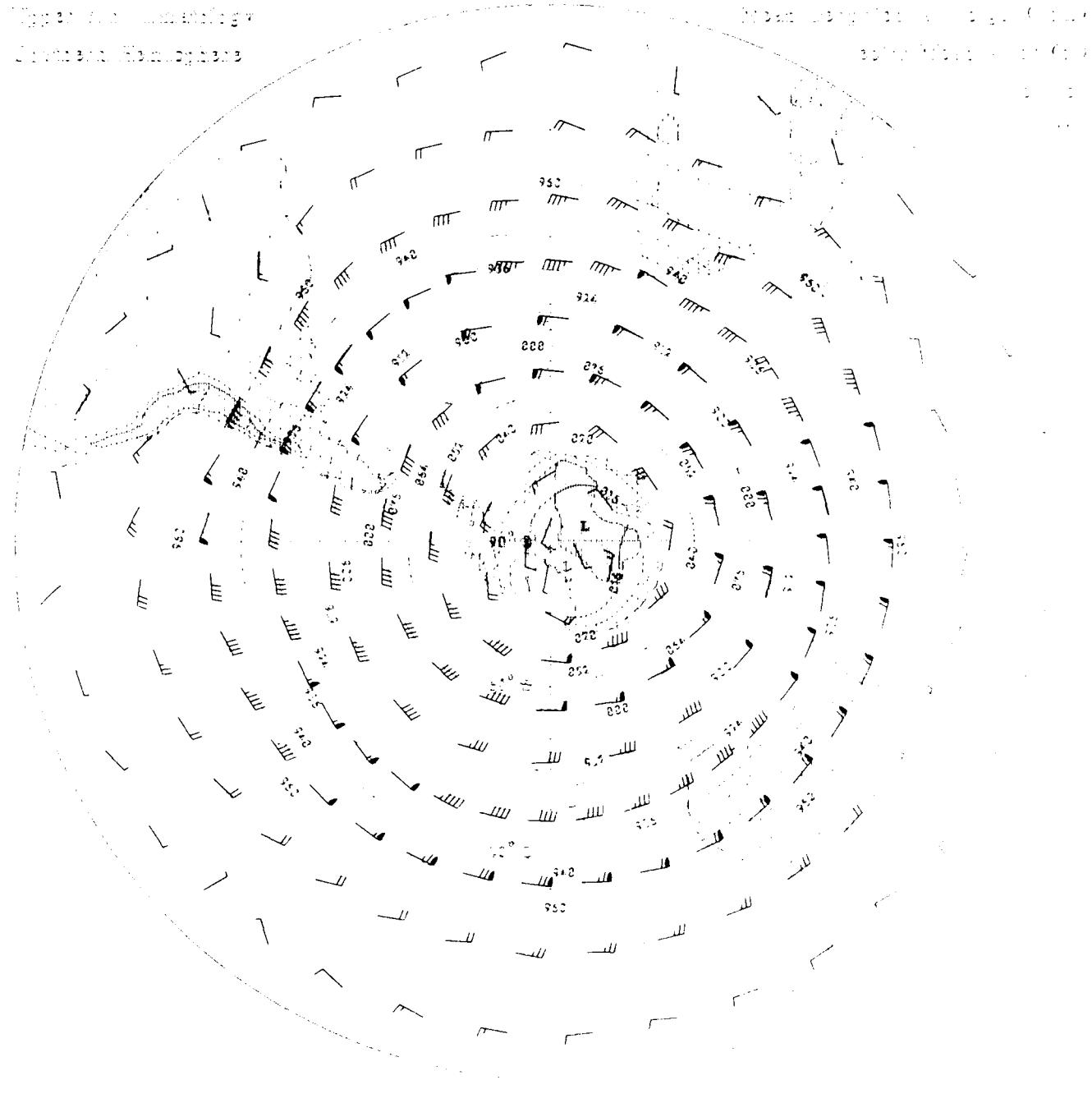
330

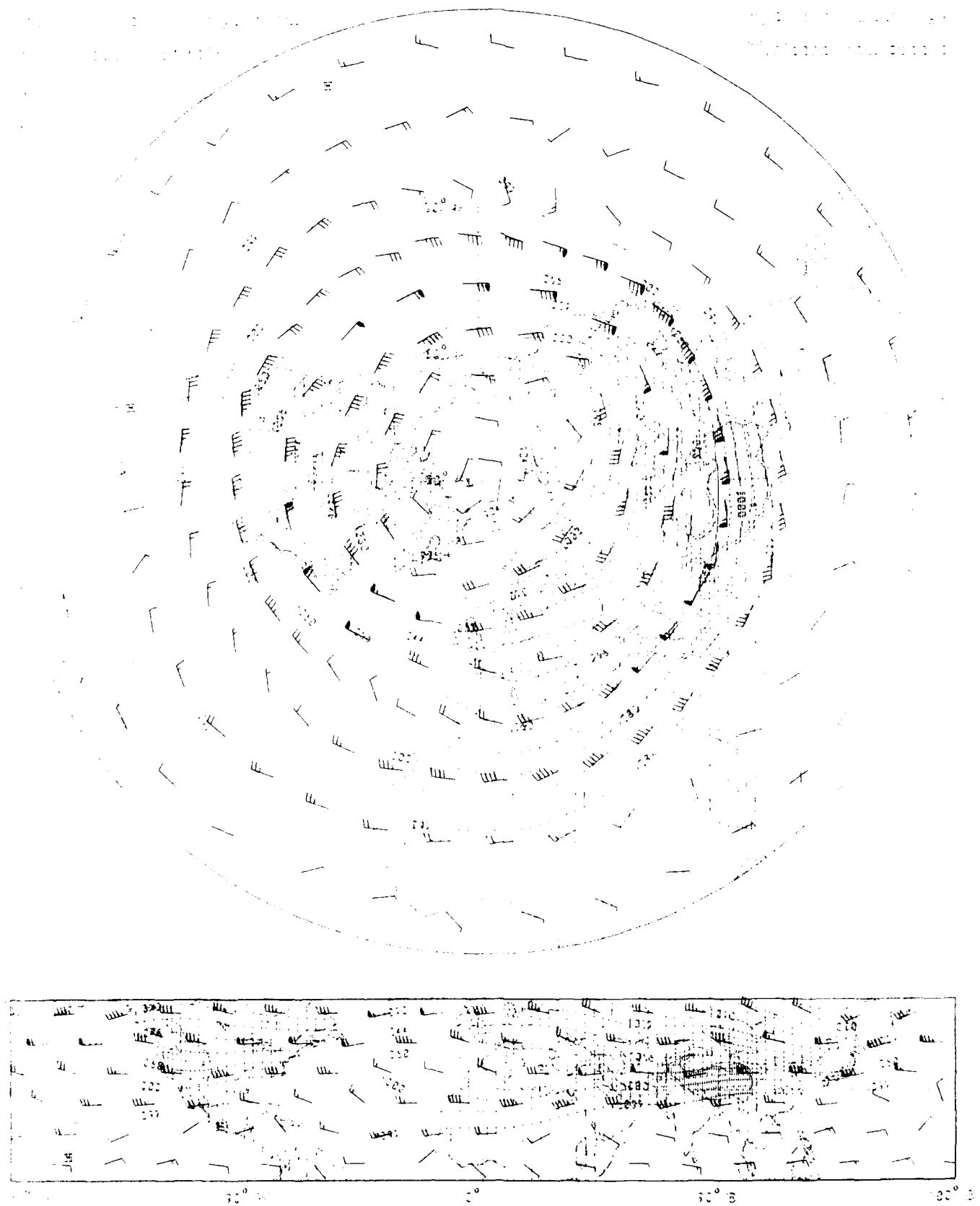
340

350

360



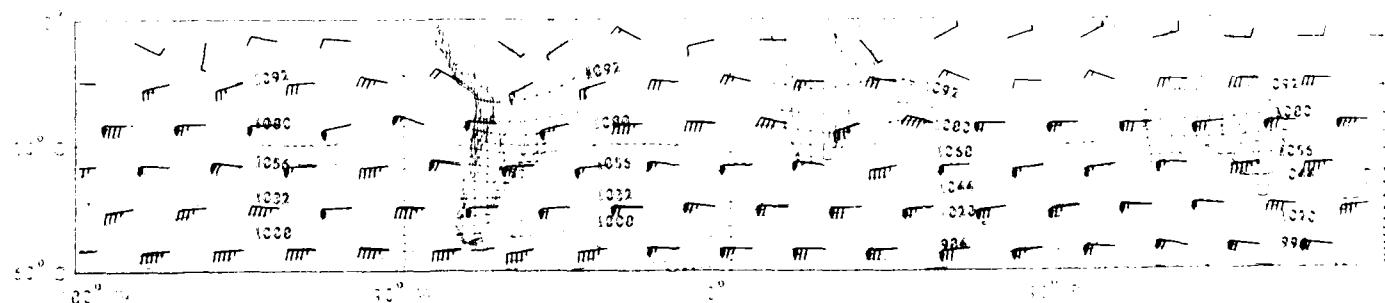
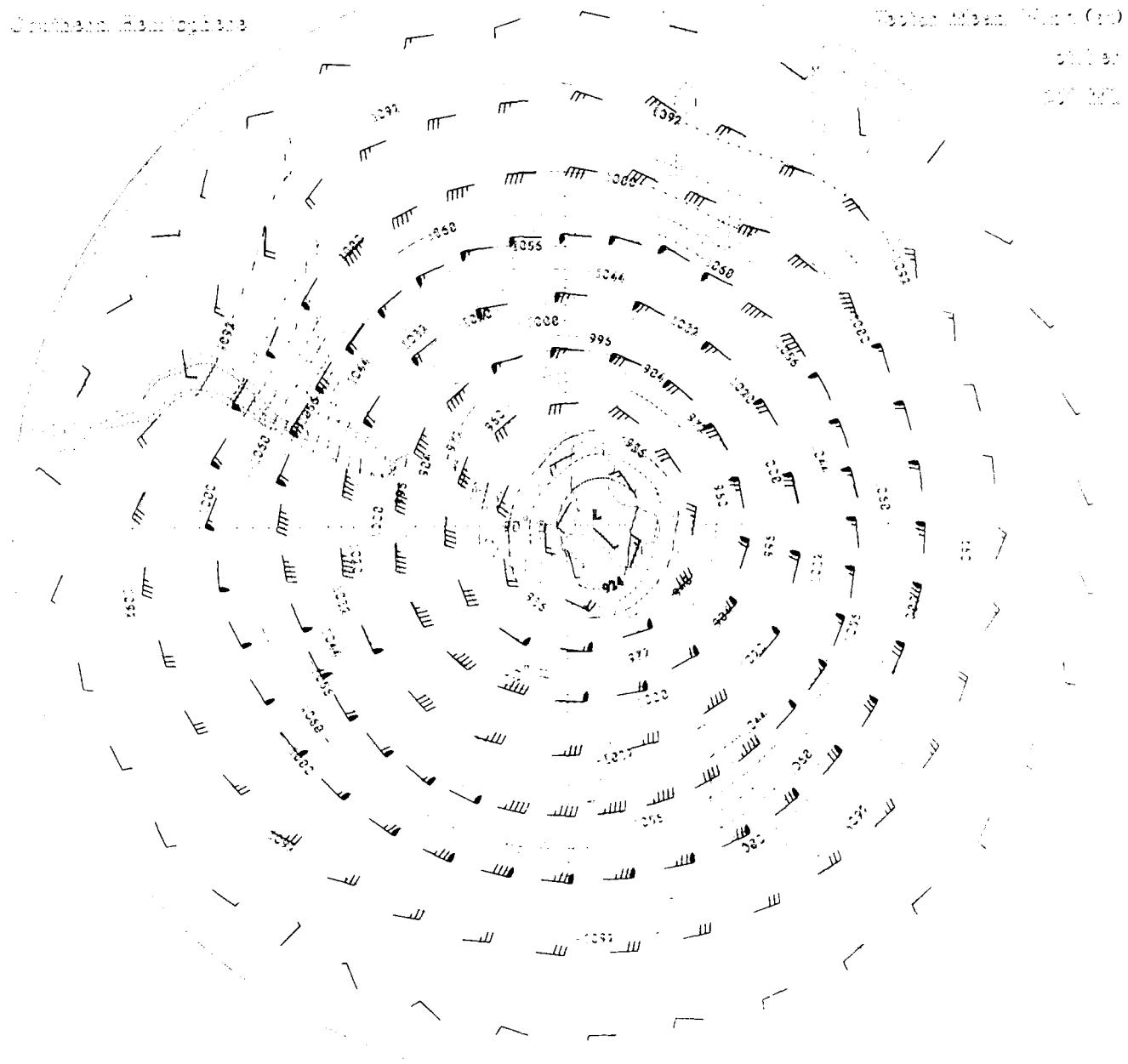


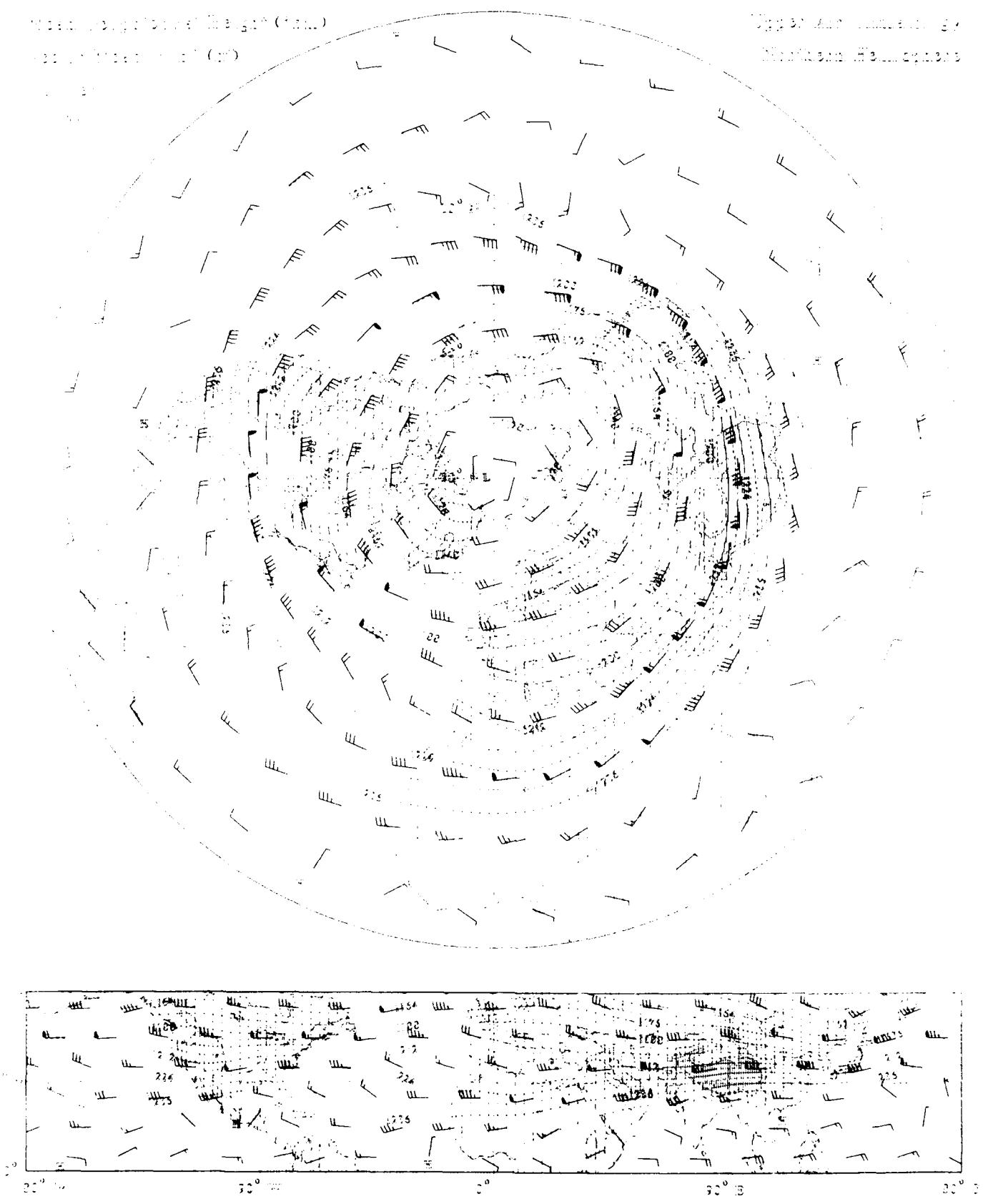


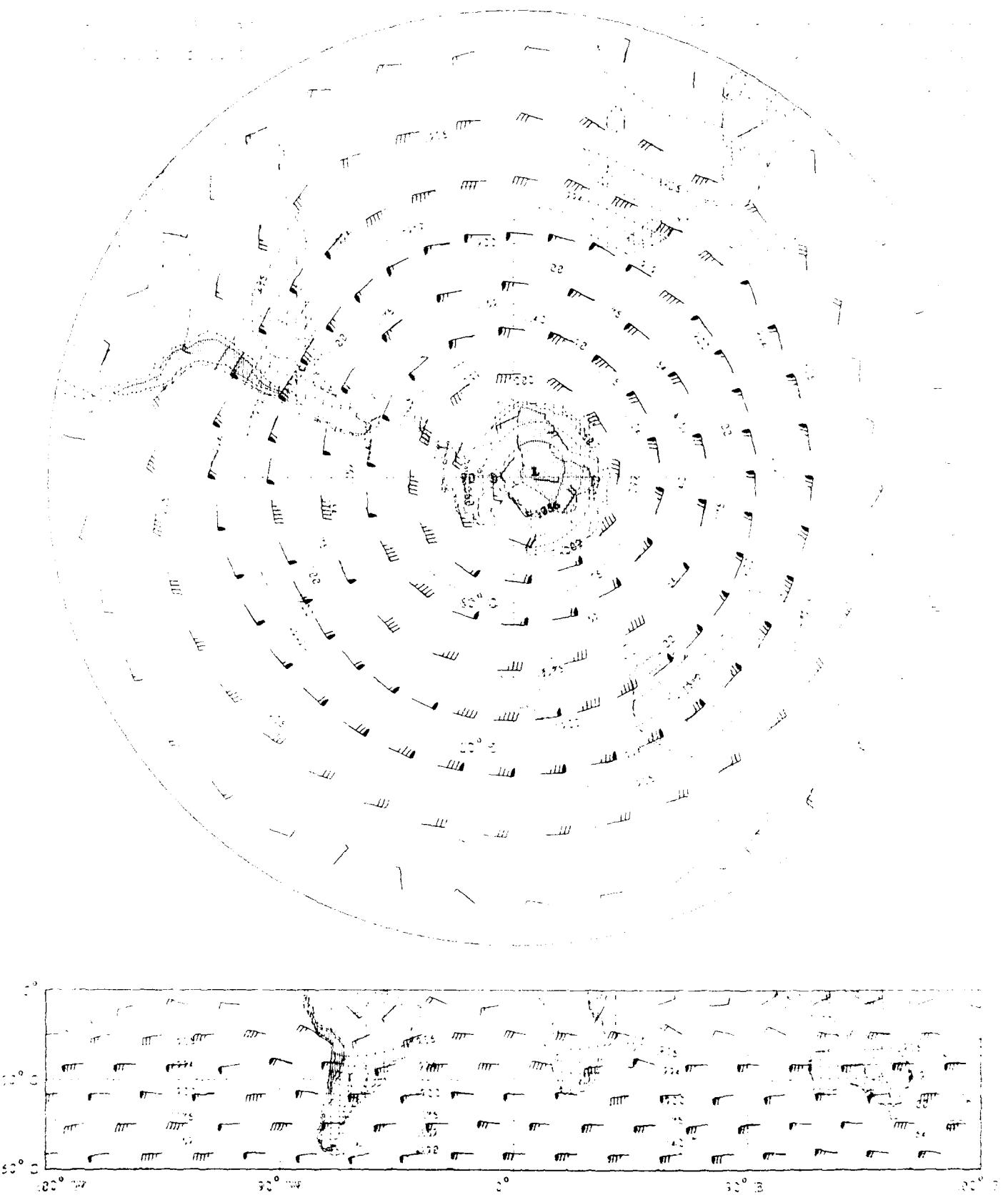
1972-02-01 1972-02-01

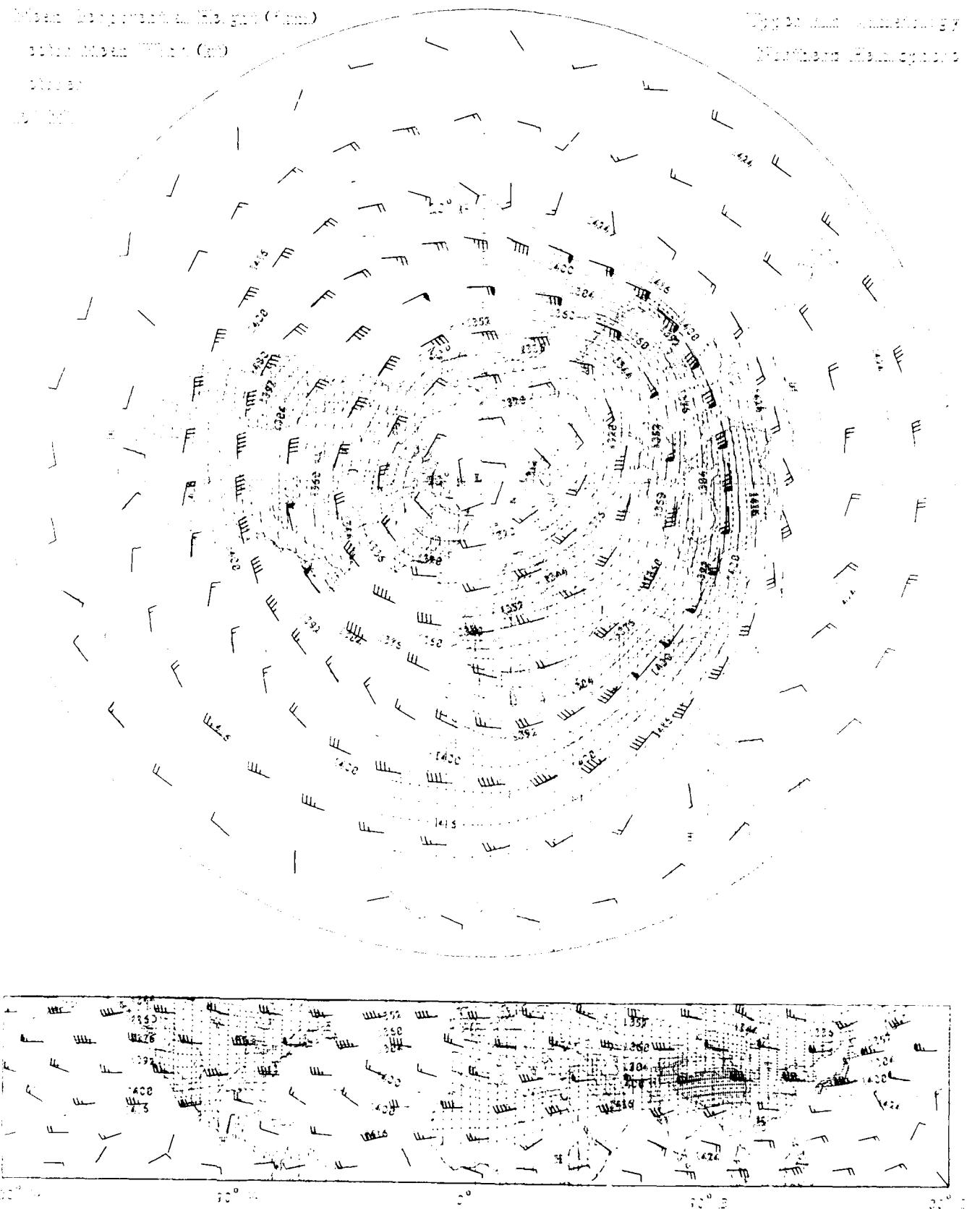
Journal of the American Mathematical Society

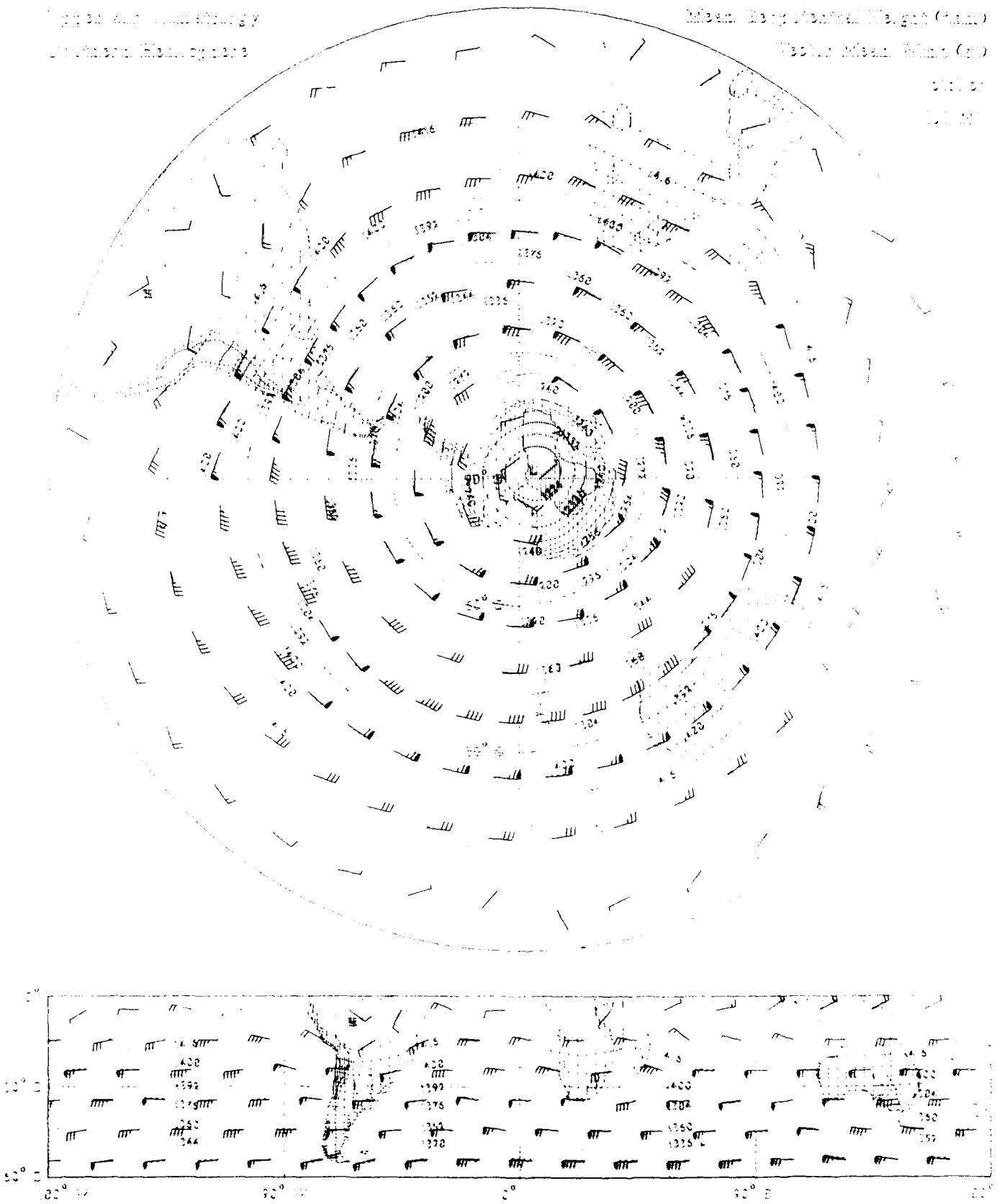
Methodology and Materials Used (Continued)











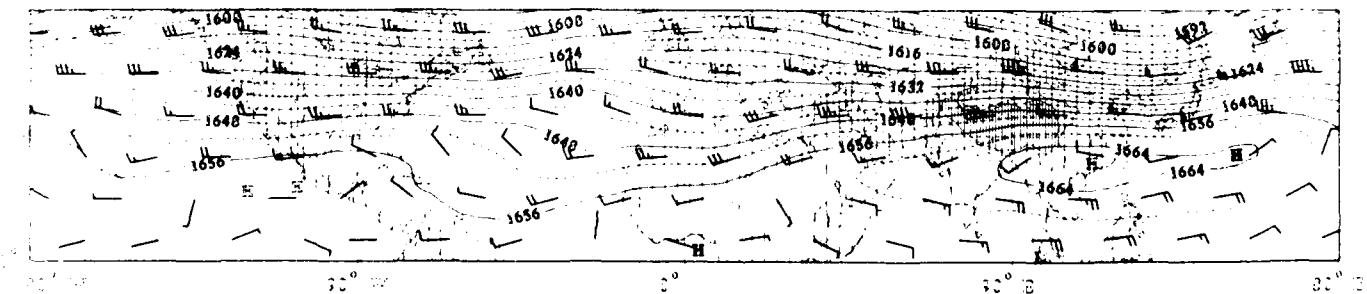
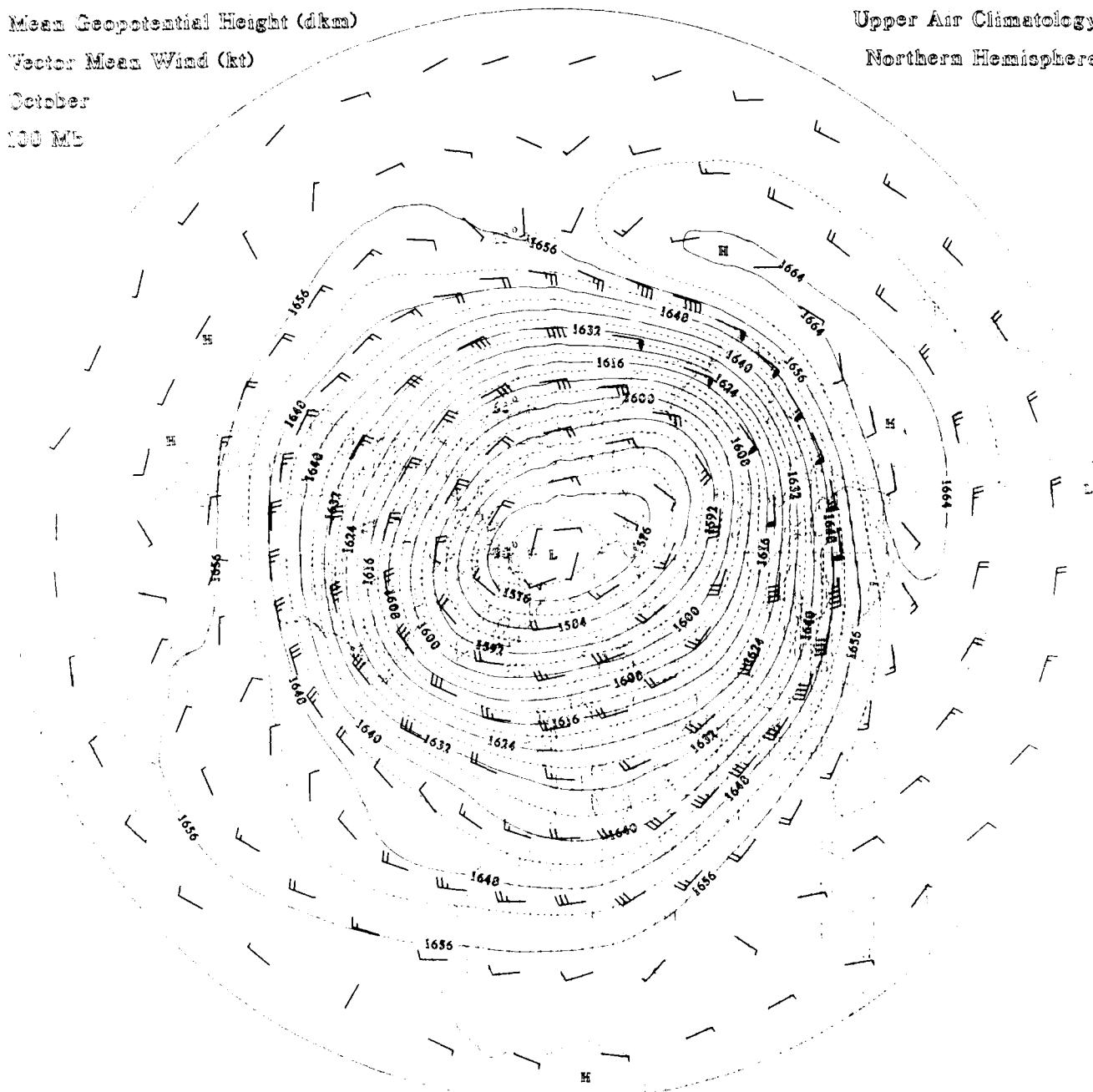
Mean Geopotential Height (dkm)

Vector Mean Wind (kt)

October

100 Mb

Upper Air Climatology
Northern Hemisphere



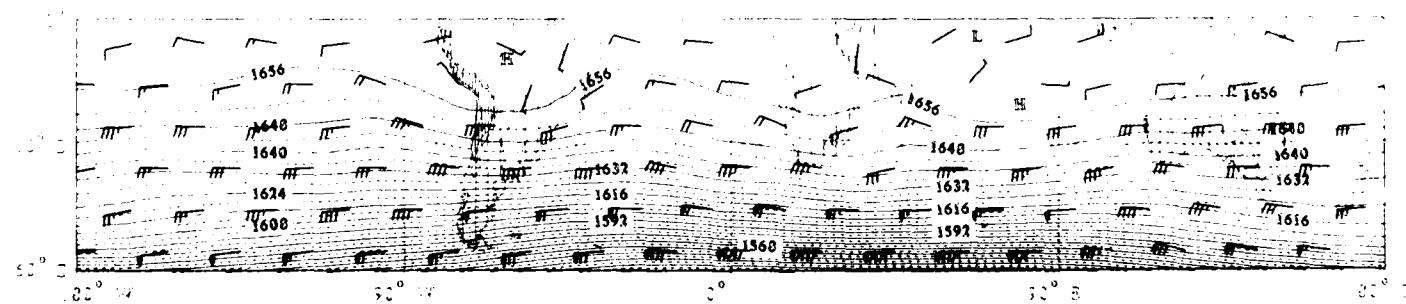
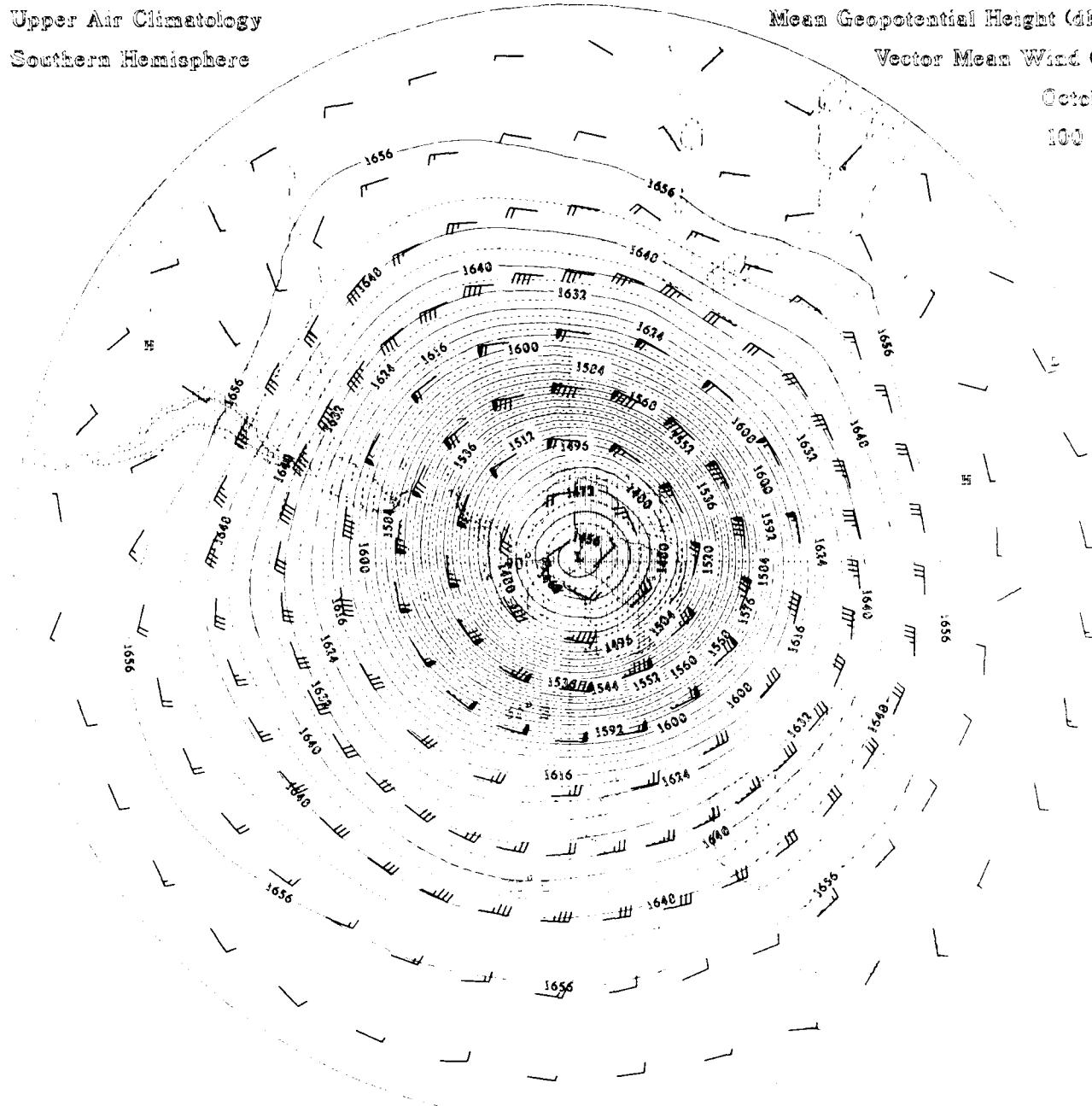
Upper Air Climatology Southern Hemisphere

Mean Geopotential Height (dkm)

Vector Mean Wind (kt)

October

100 ME



Mean Geopotential Height (dkm)

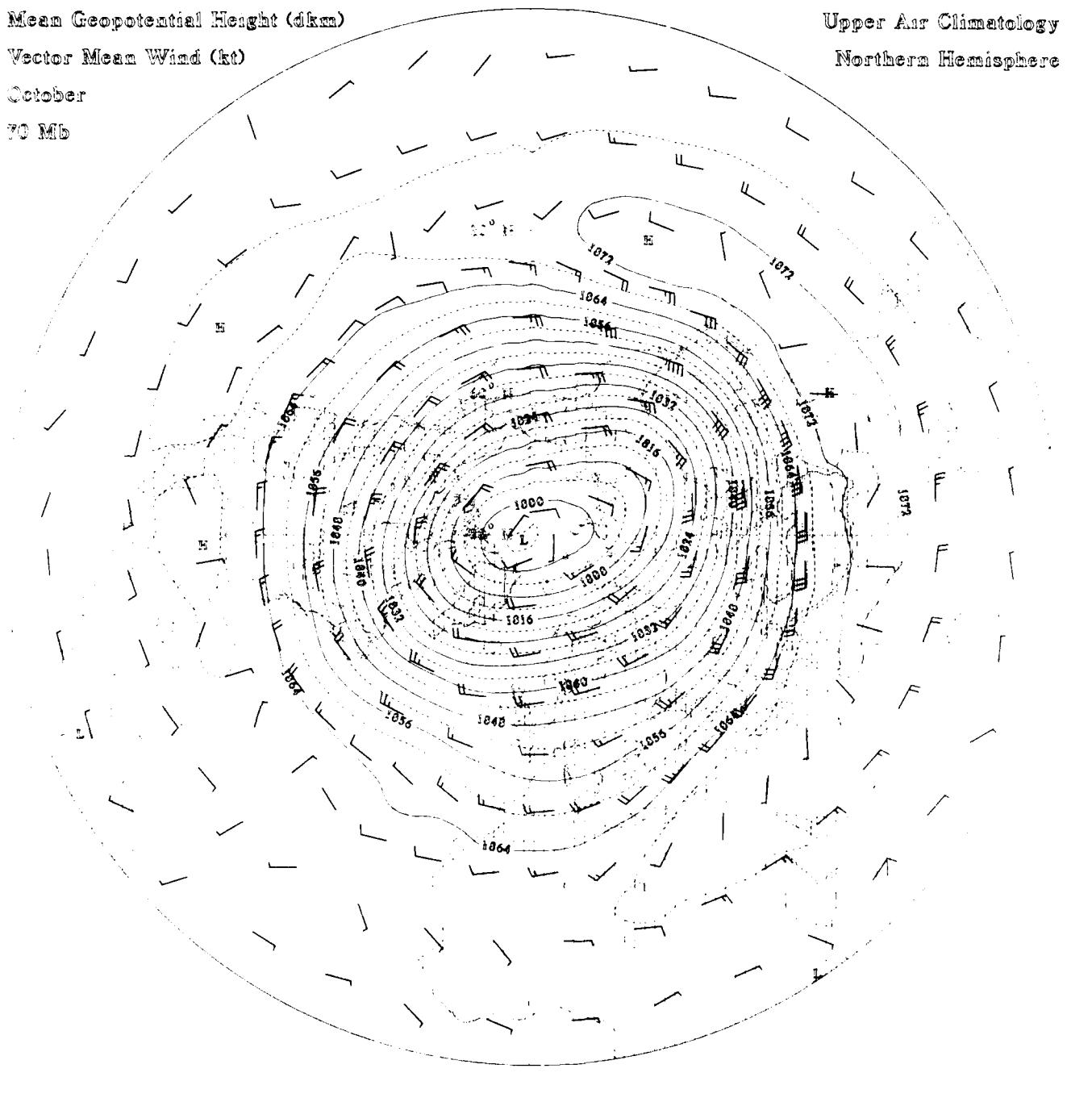
Vector Mean Wind (kt)

October

70 Mb

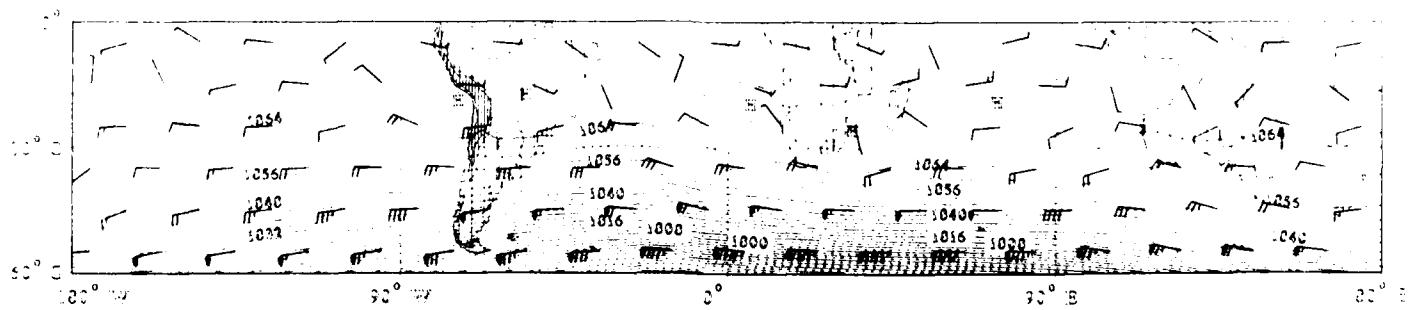
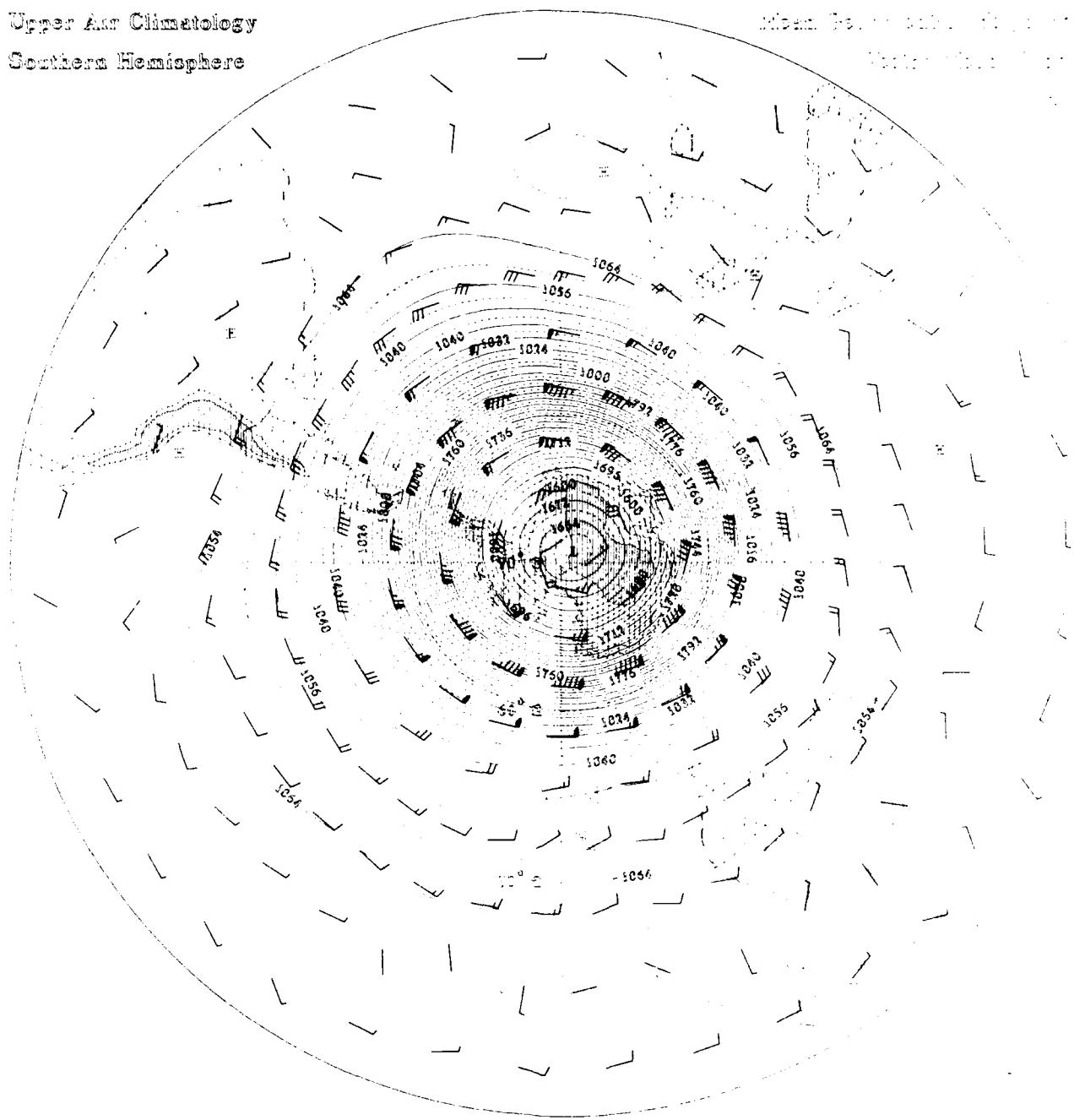
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology Southern Hemisphere

W. H. D. - W. H. D. - W. H. D.

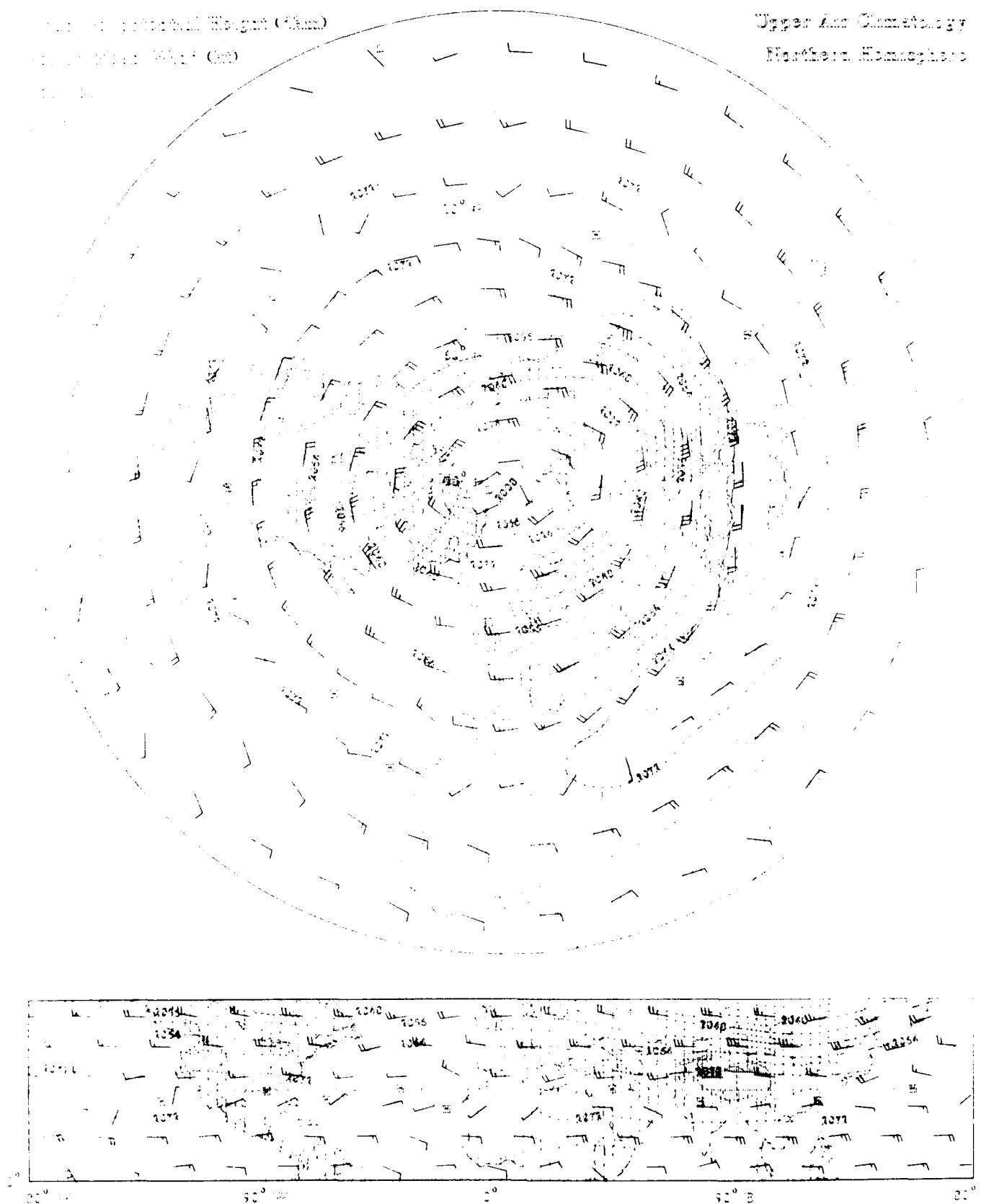


Classification of Wages (Class)

Journal of Statistical Physics, Vol. 100, No. 3, 2000

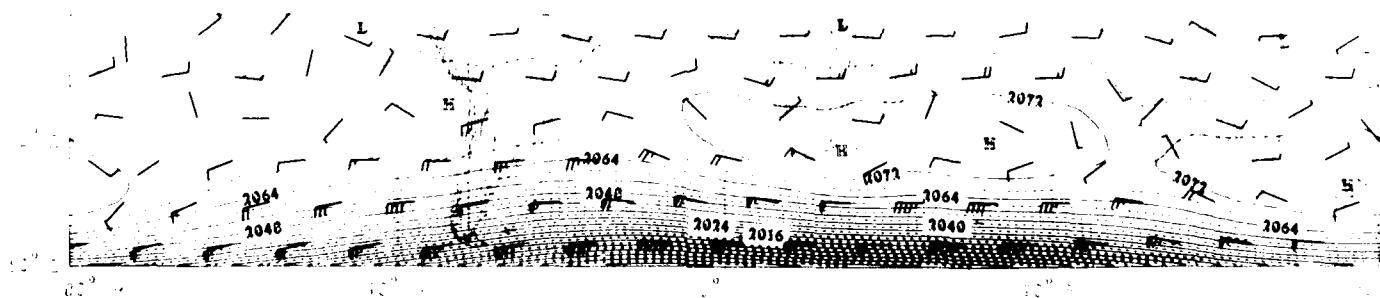
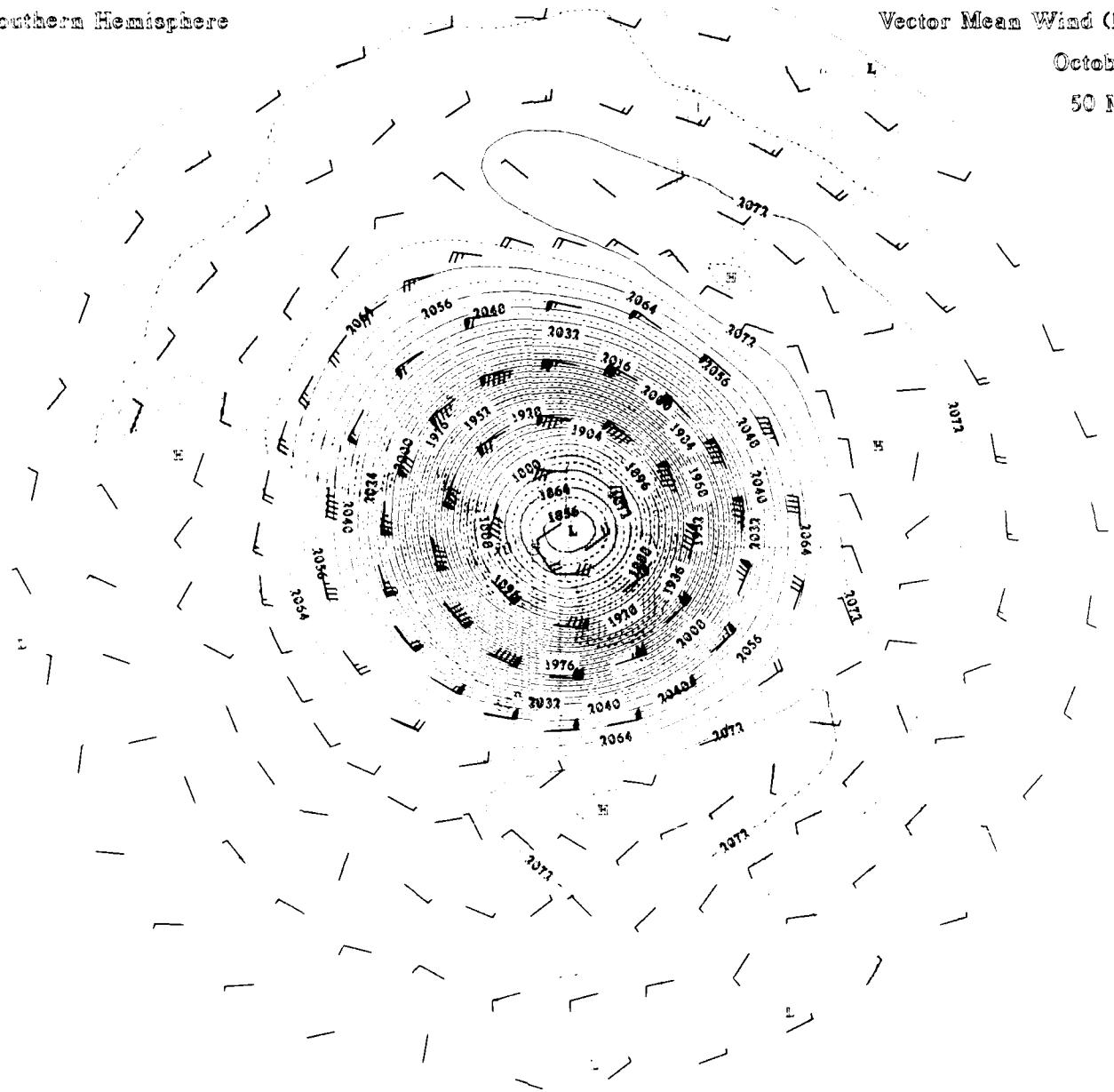
Upper And Lowercase

Figure 1. Summary



Upper Air Climatology
Southern Hemisphere

Mean Geopotential Height (dkm)
Vector Mean Wind (kt)
October
50 MB



Mean Geopotential Height (dkm)

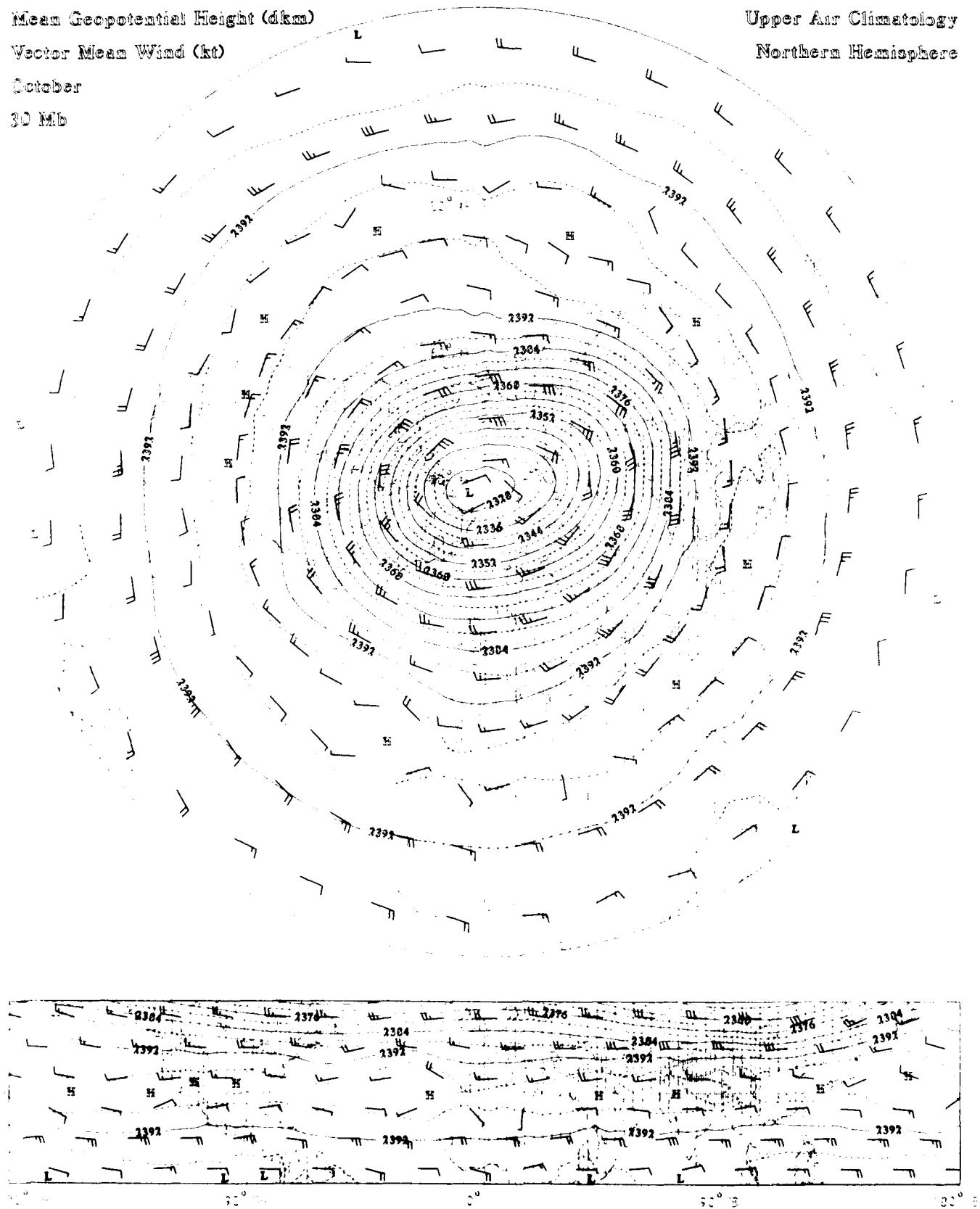
Vector Mean Wind (kt)

October

30 Mb

Upper Air Climatology

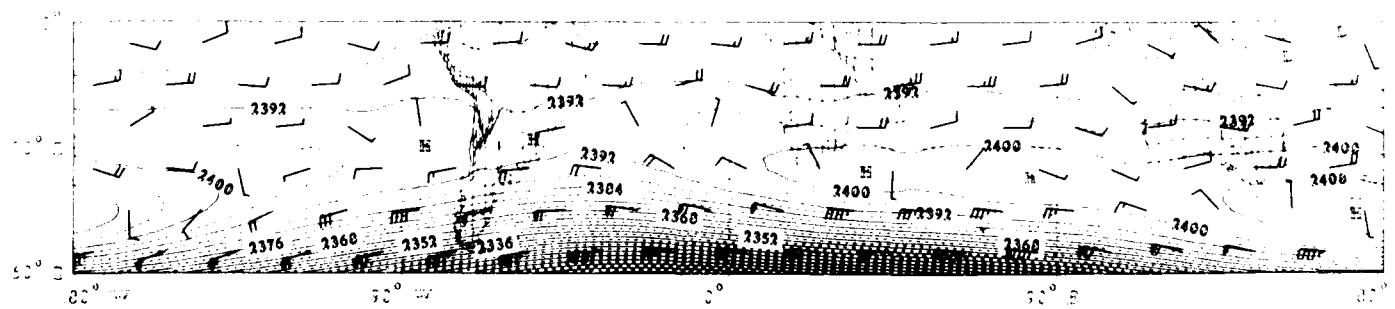
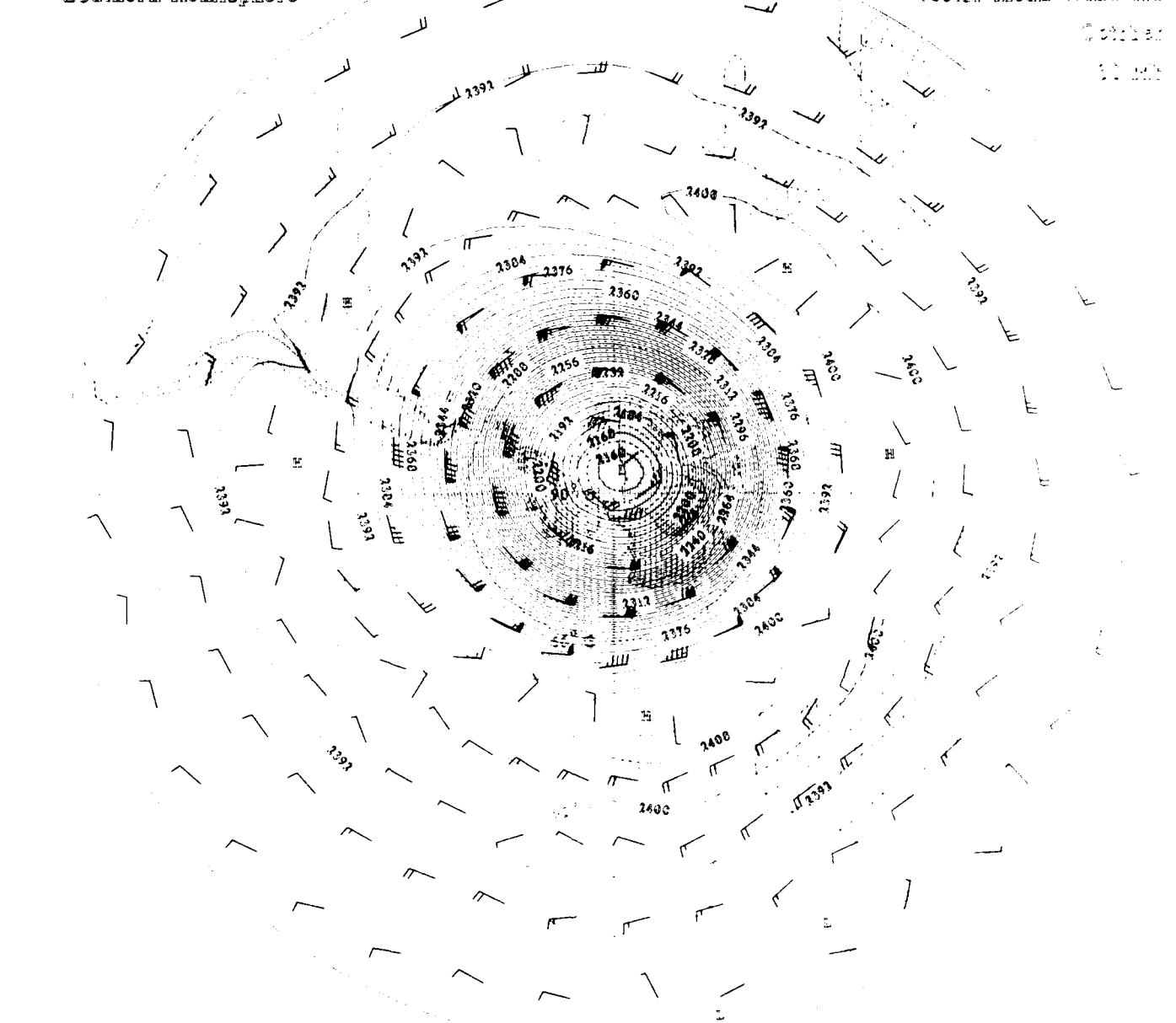
Northern Hemisphere



Upper Air Climatology Southern Hemisphere

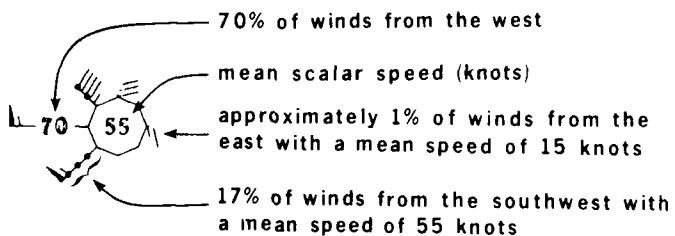
Mean Geopotential Height (km)

Vector Mean Wind (\bar{v})

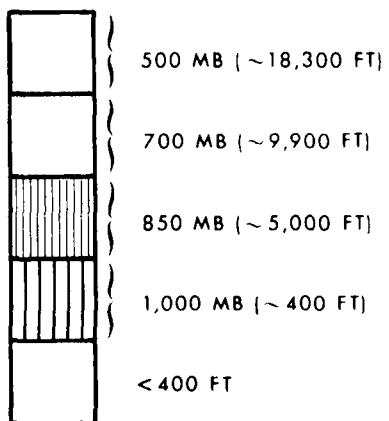


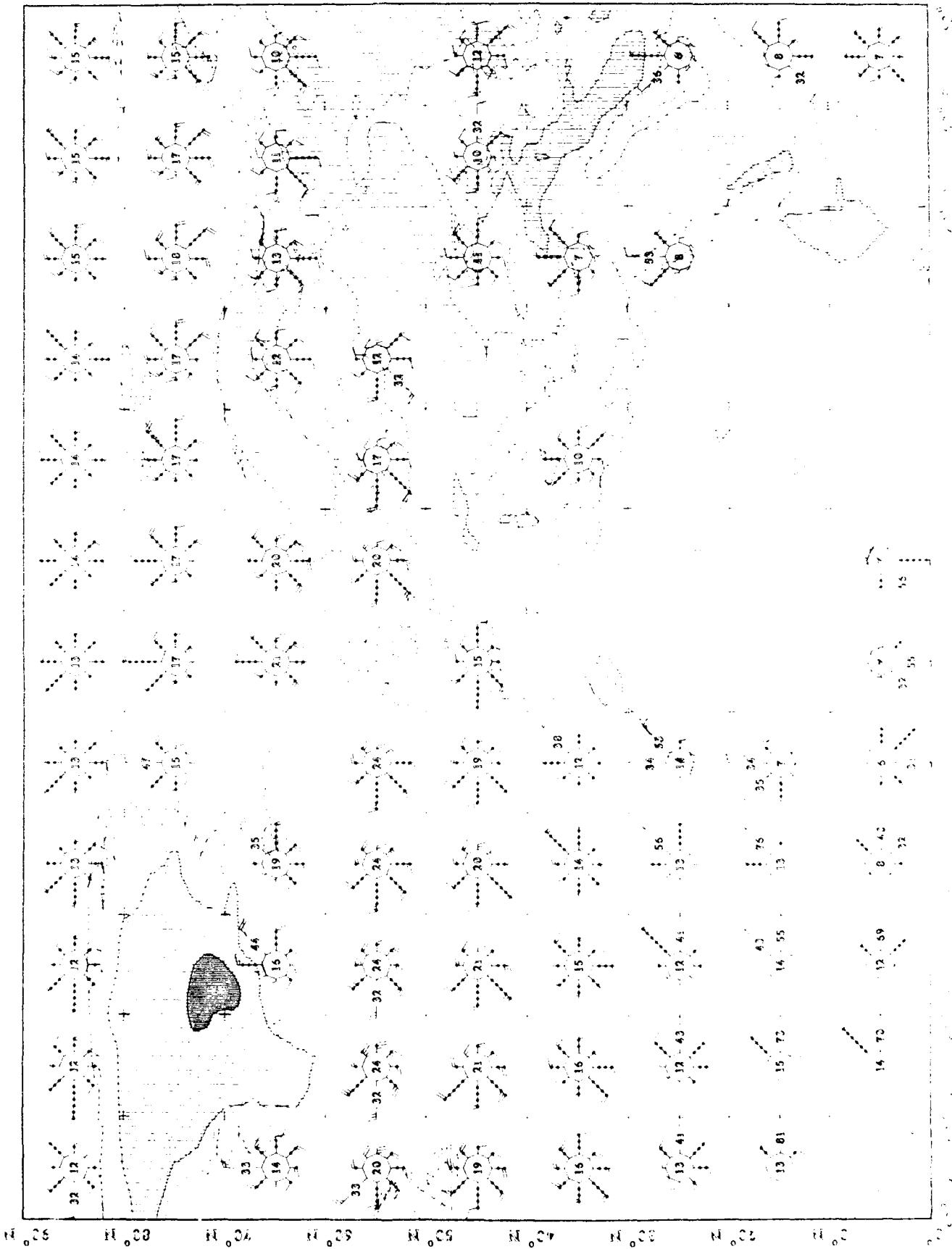
**WIND ROSES
(13 LEVELS, 1000 TO 30 MB)**

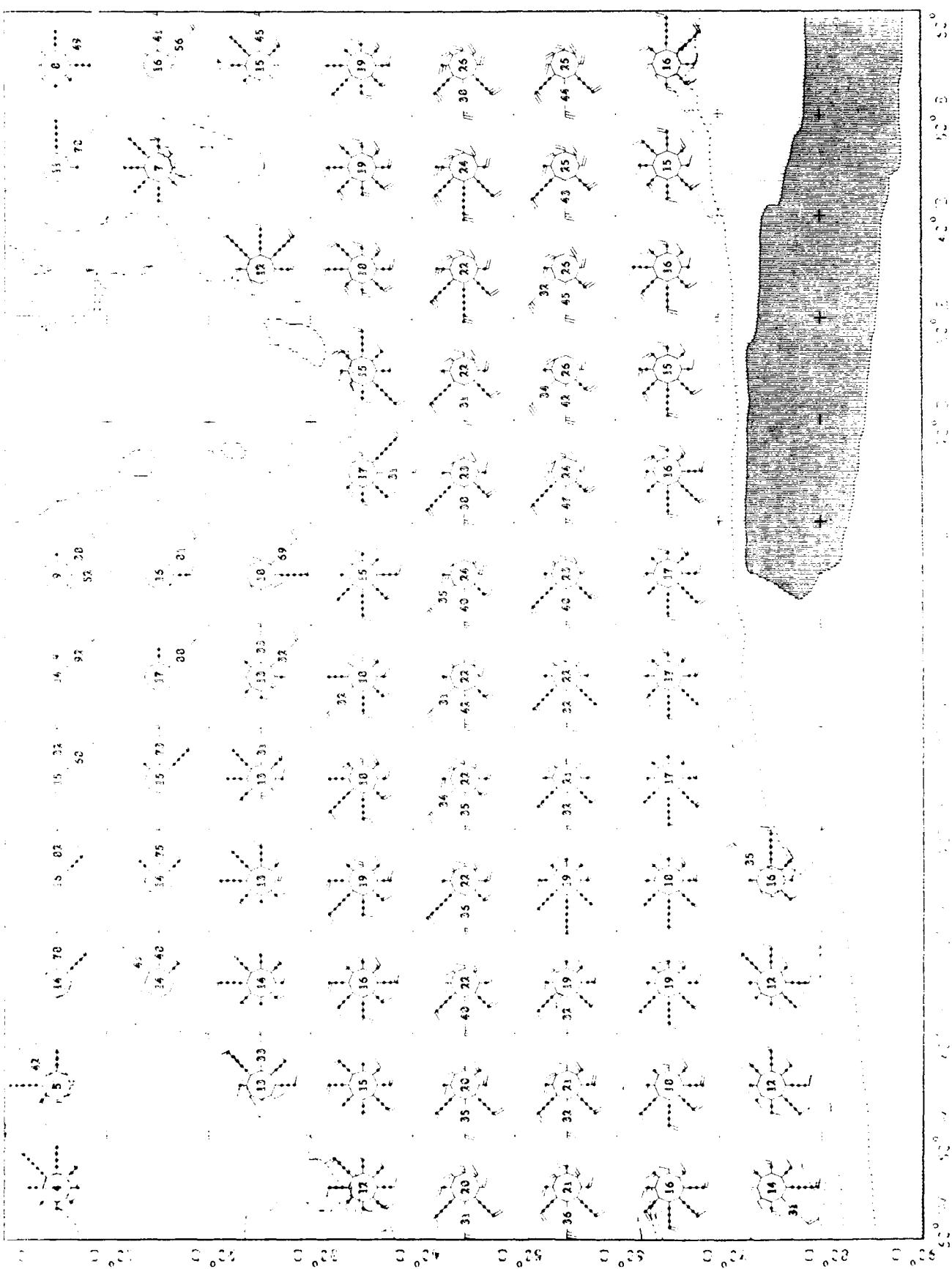
- Wind roses at 10 degree latitude/longitude grid points
- Directional mean wind speed in 5 knot increments
- Frequency proportional to barb length with individual dots representing 5% increments. Values greater than 30% are plotted directly on the barb.
- Roses blanked at grid points with elevations exceeding specified geopotential heights.
- Sample rose explanation:

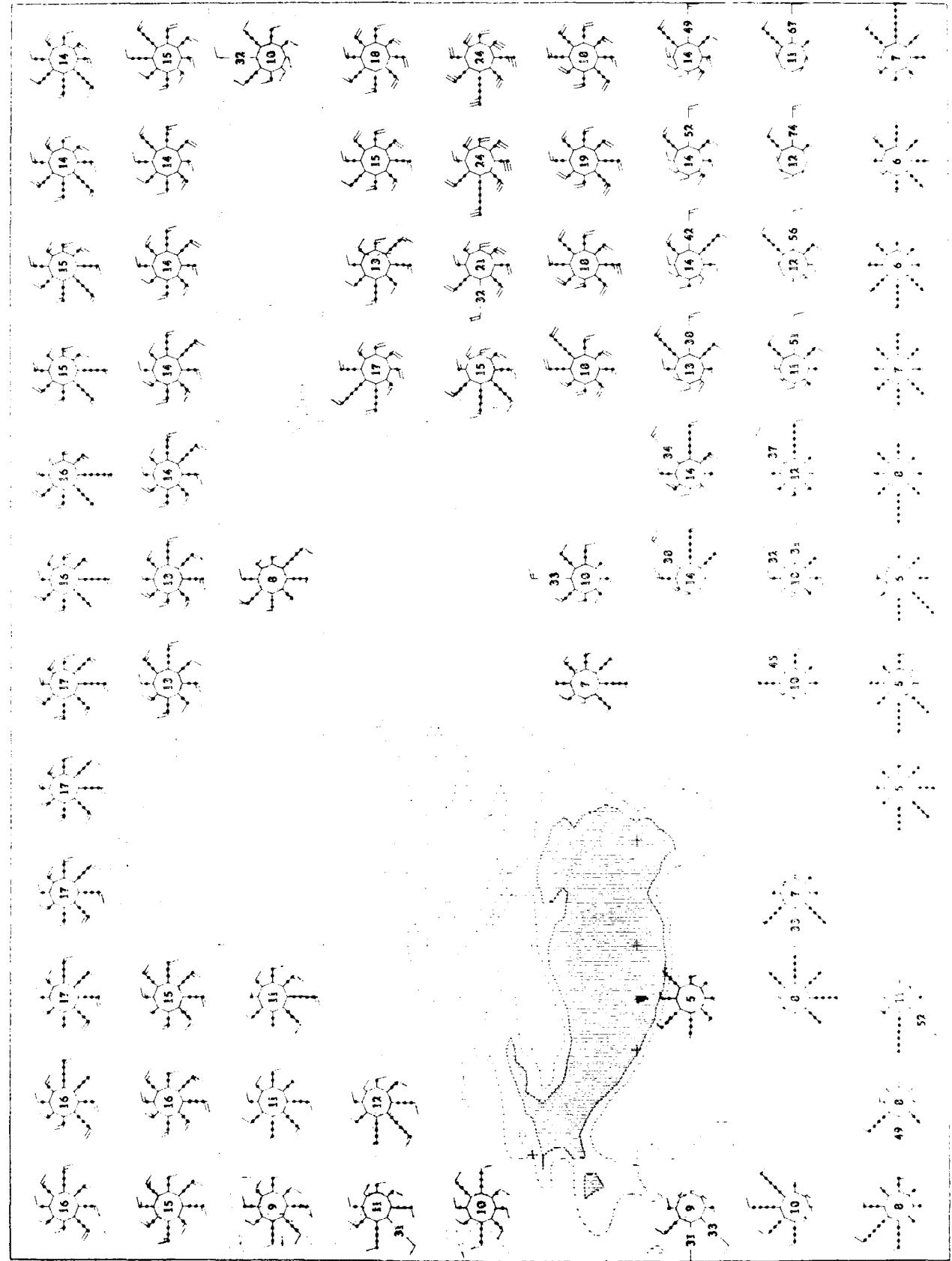


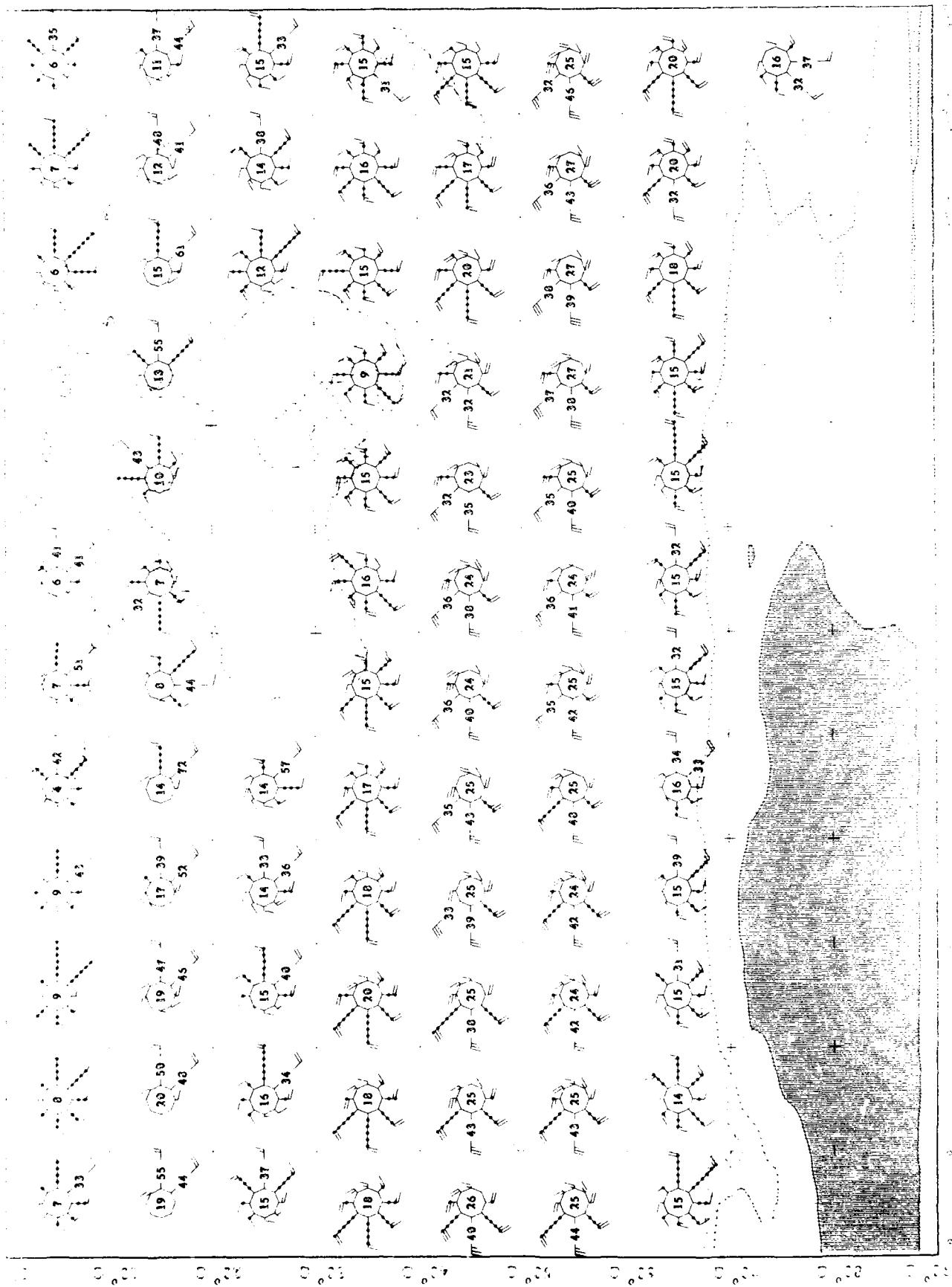
ELEVATION SCALE







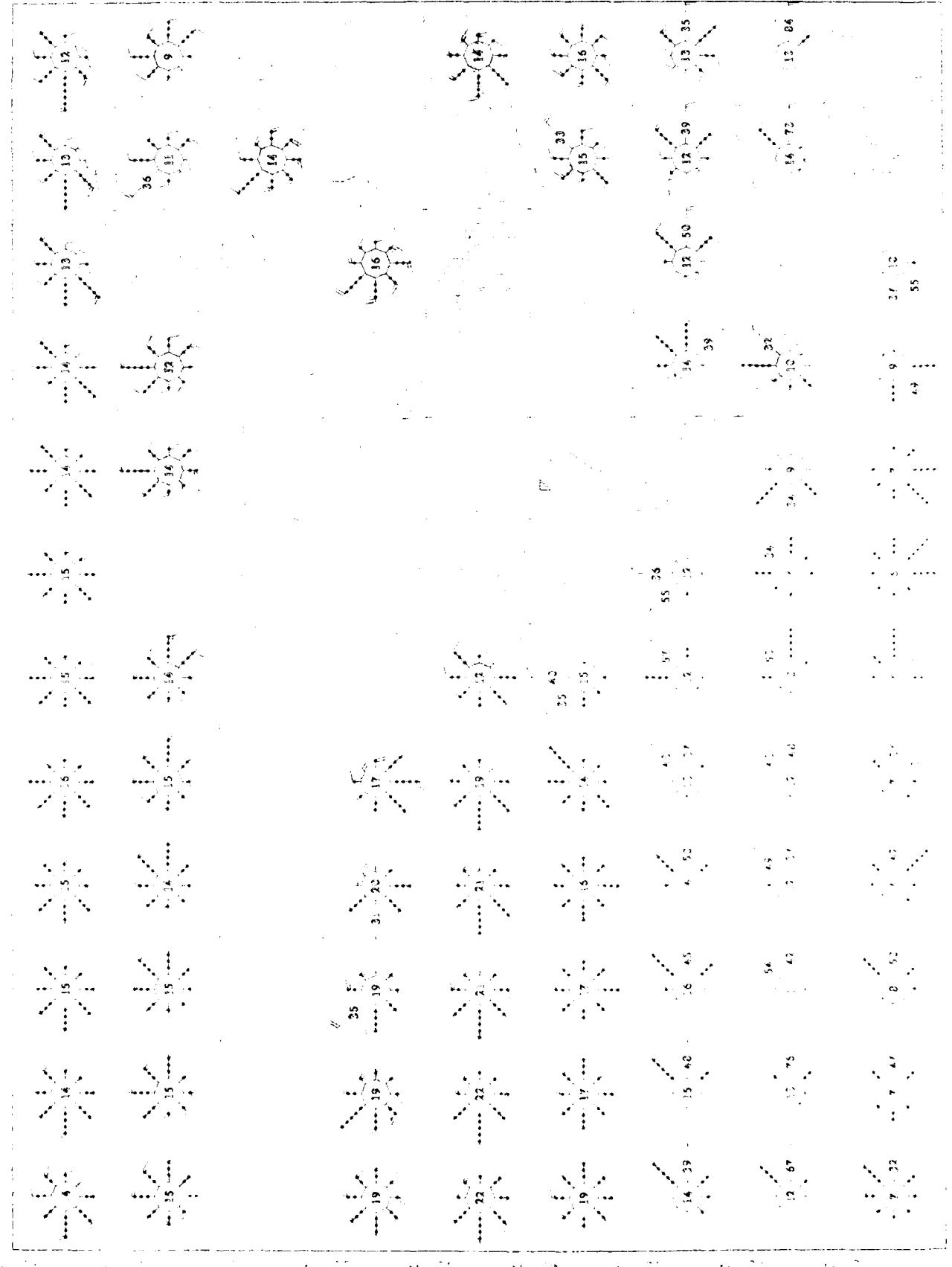


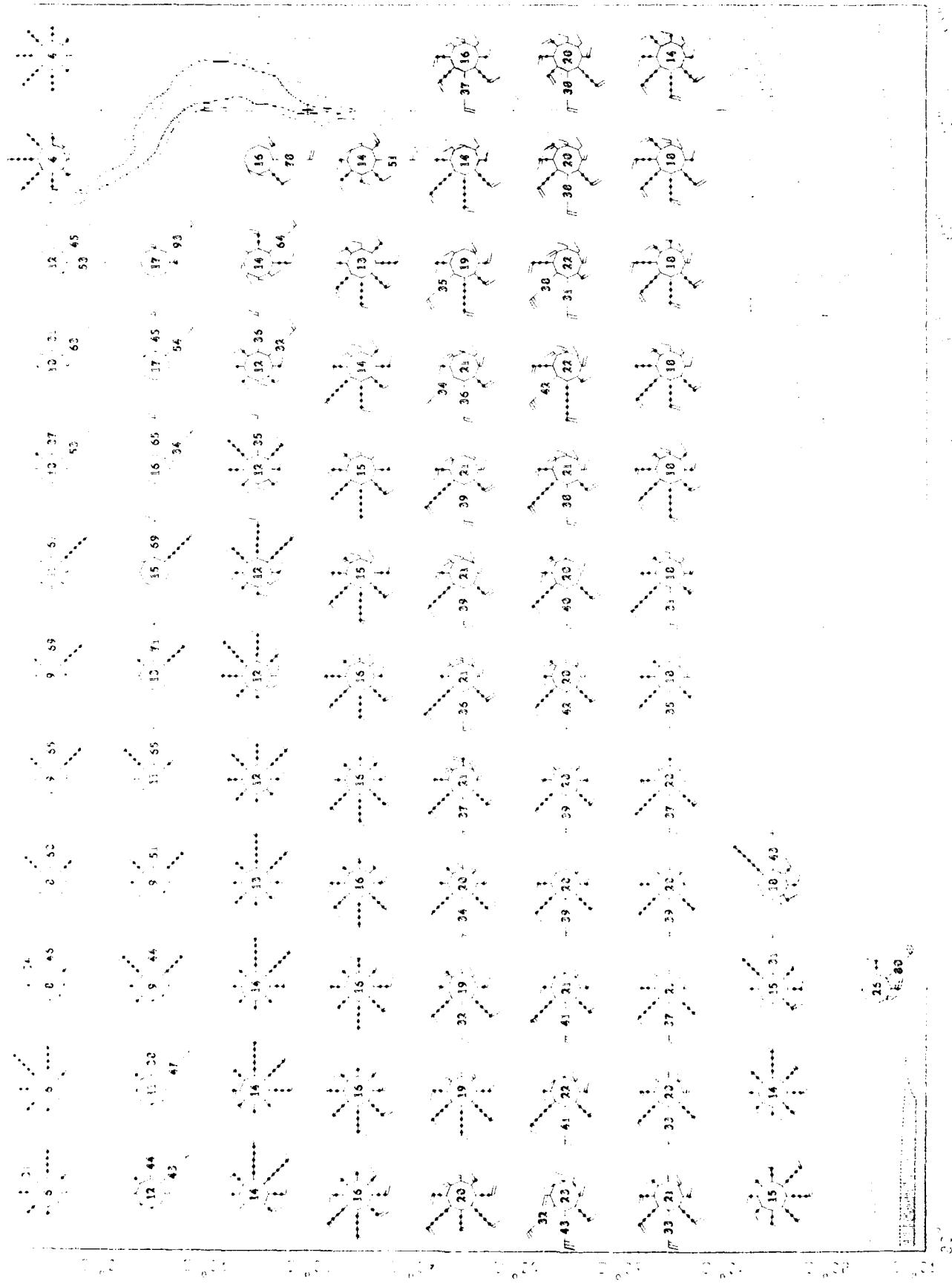


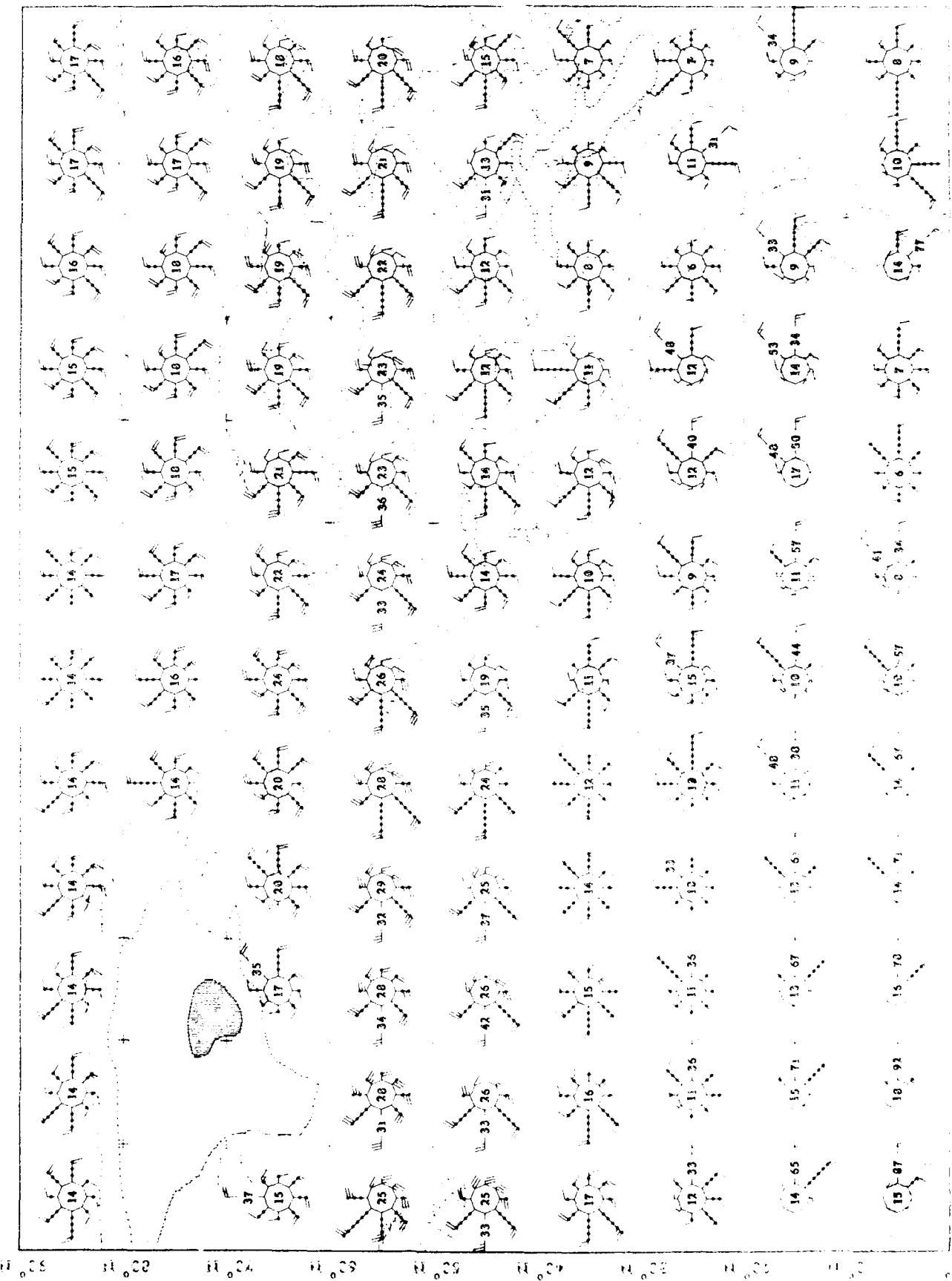
October
1990

卷之三

Upper Air Climatology Southern Hemisphere



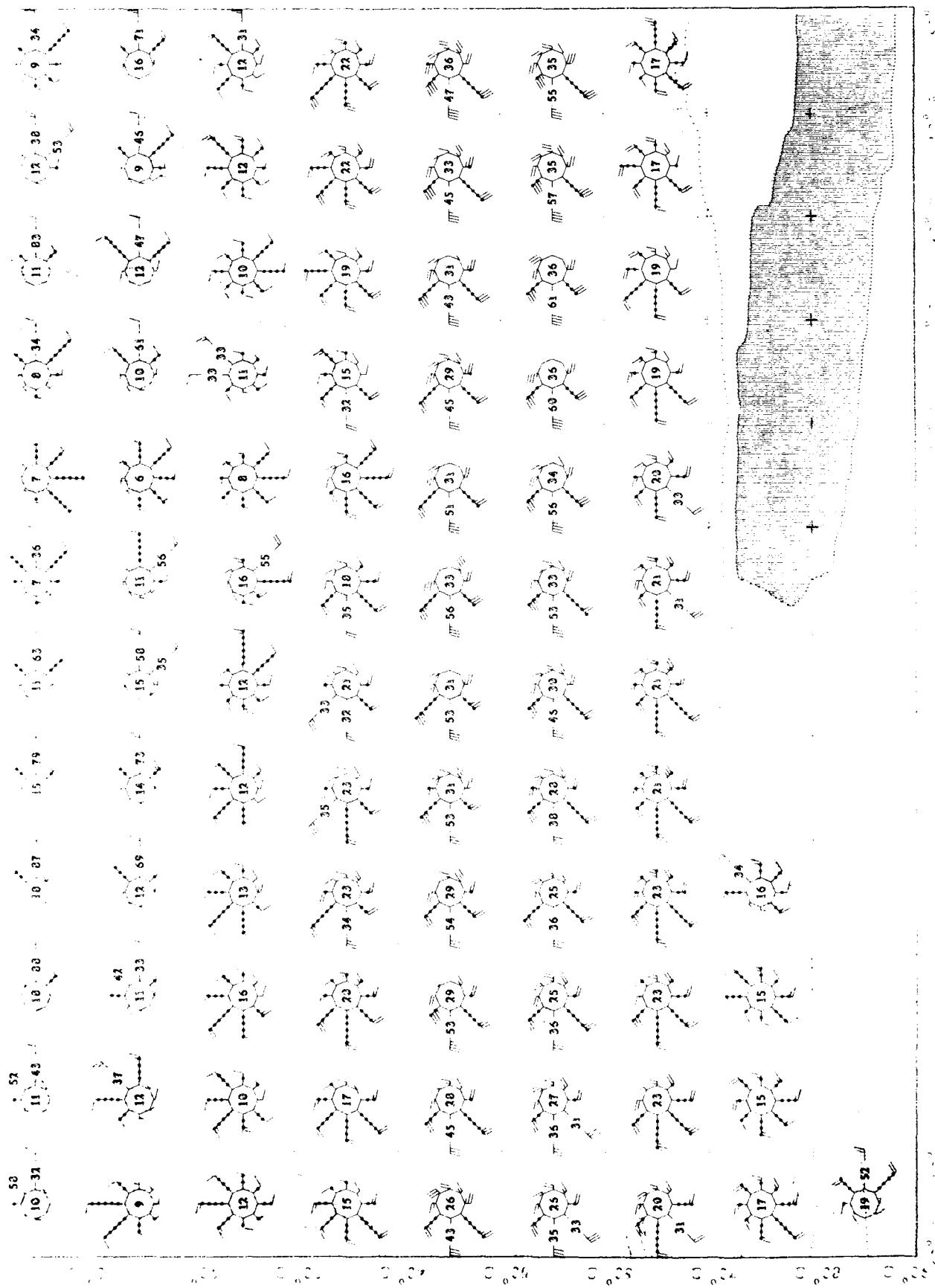


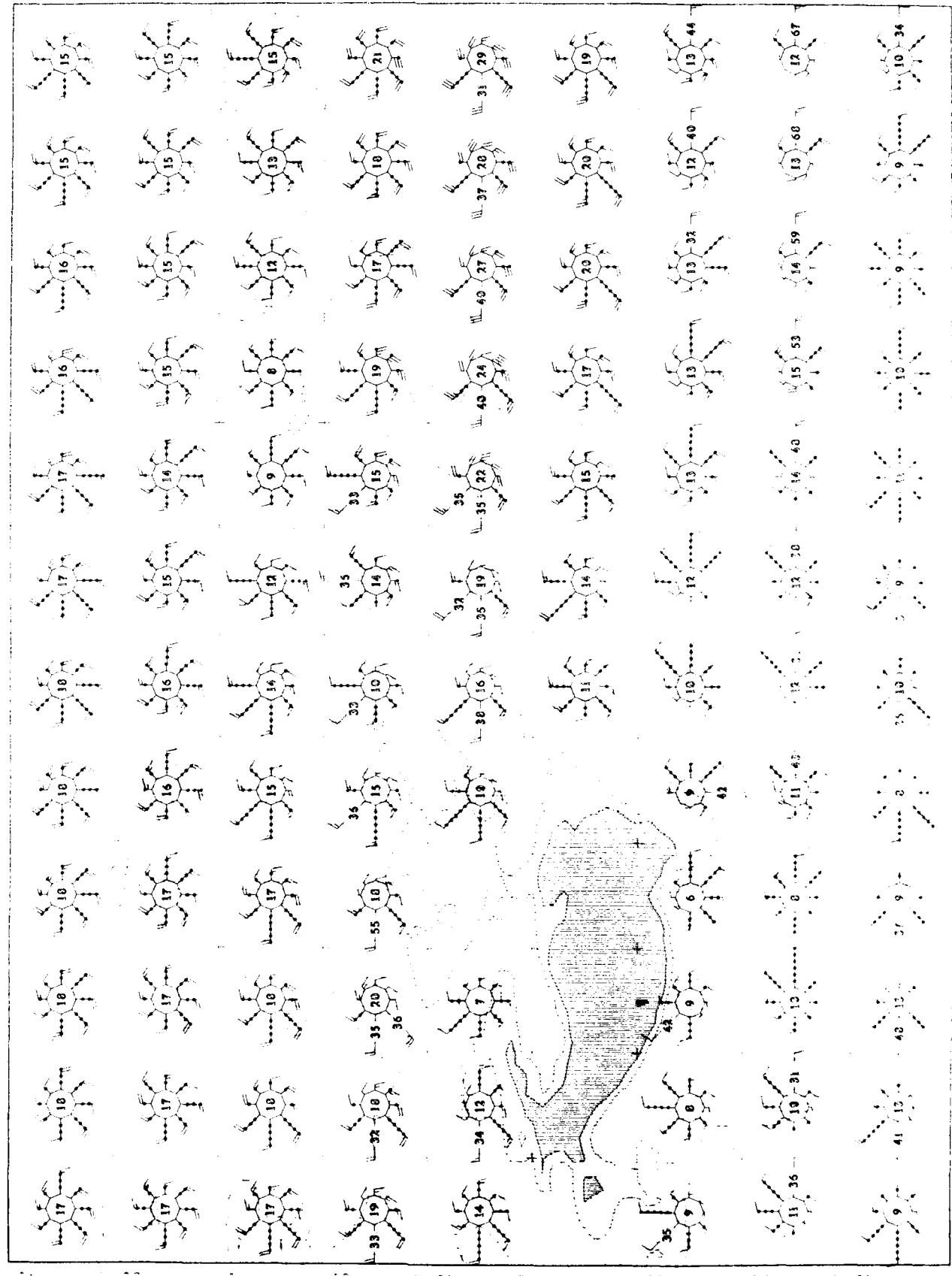


Upper Air Climatology
Southern Hemisphere

1950-51 1951-52
1951-52 1952-53

Orographic
3500 ft.





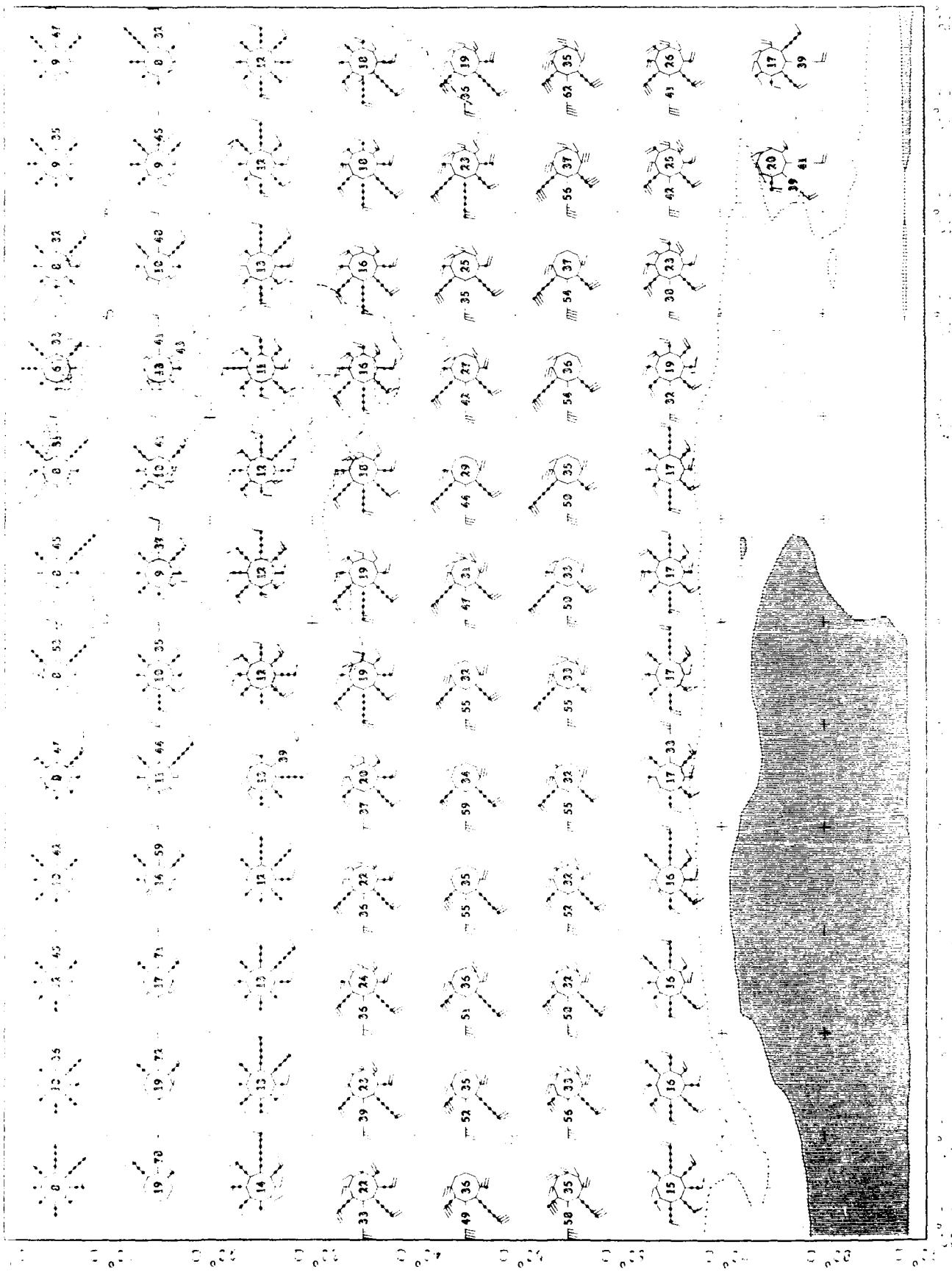
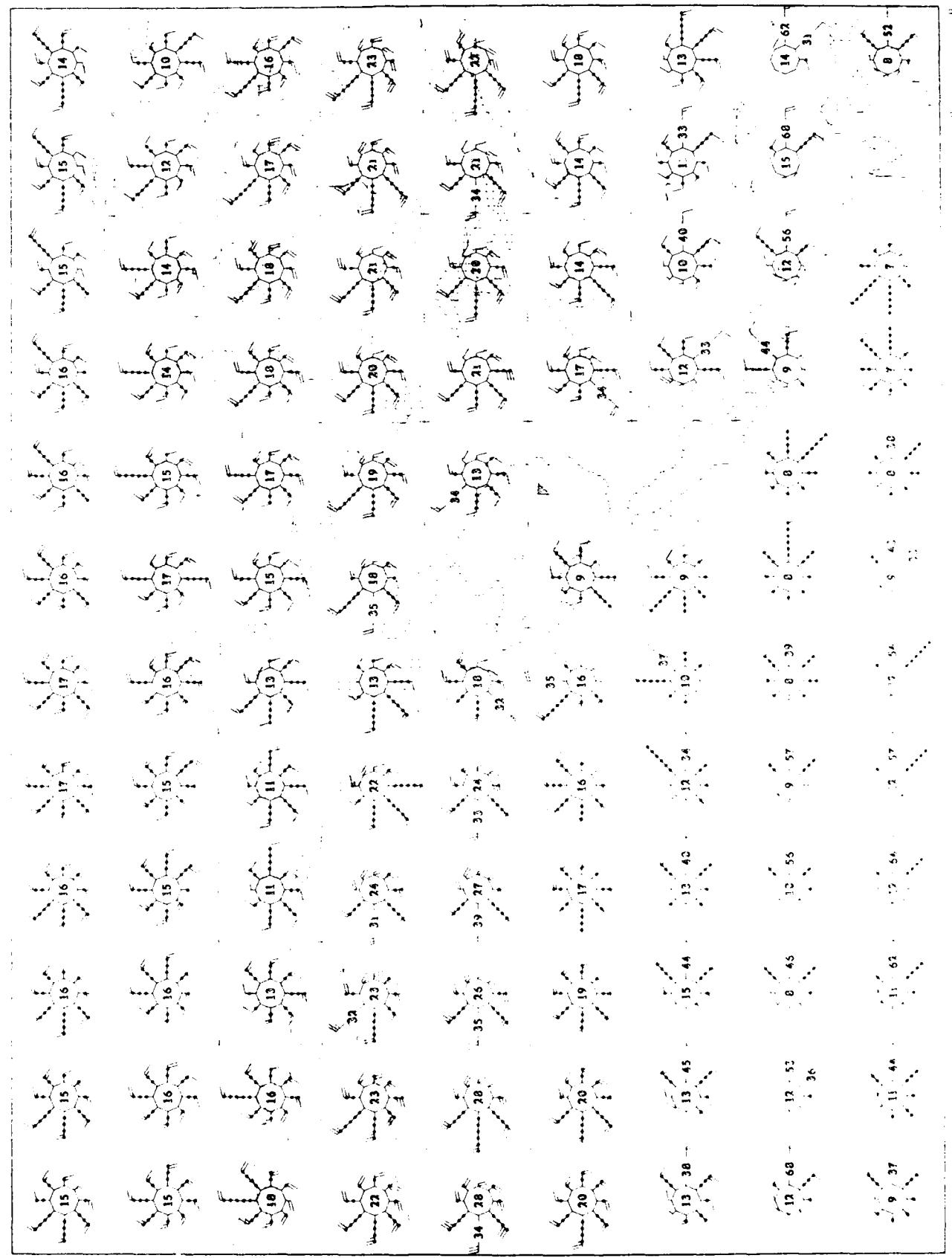
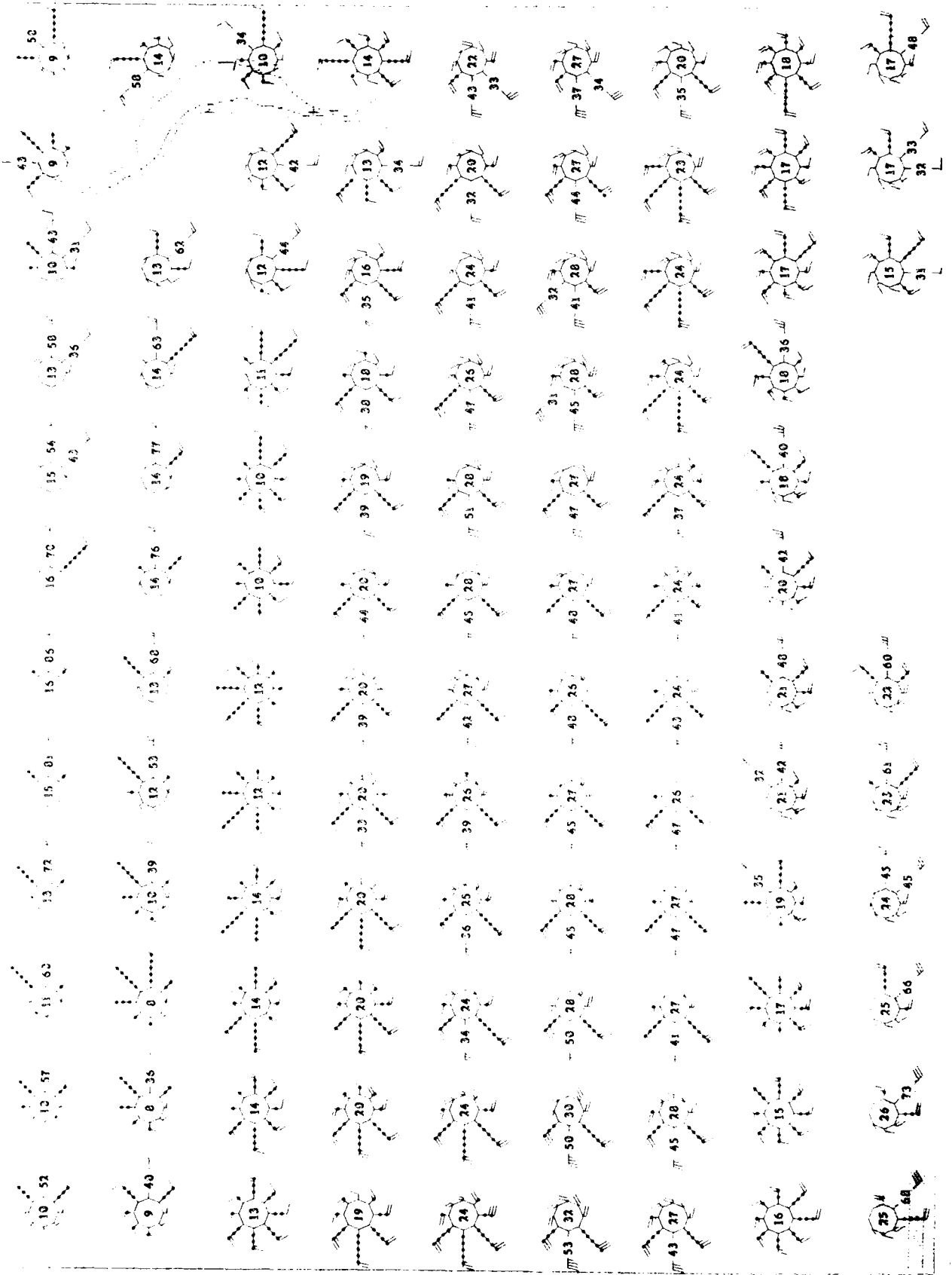
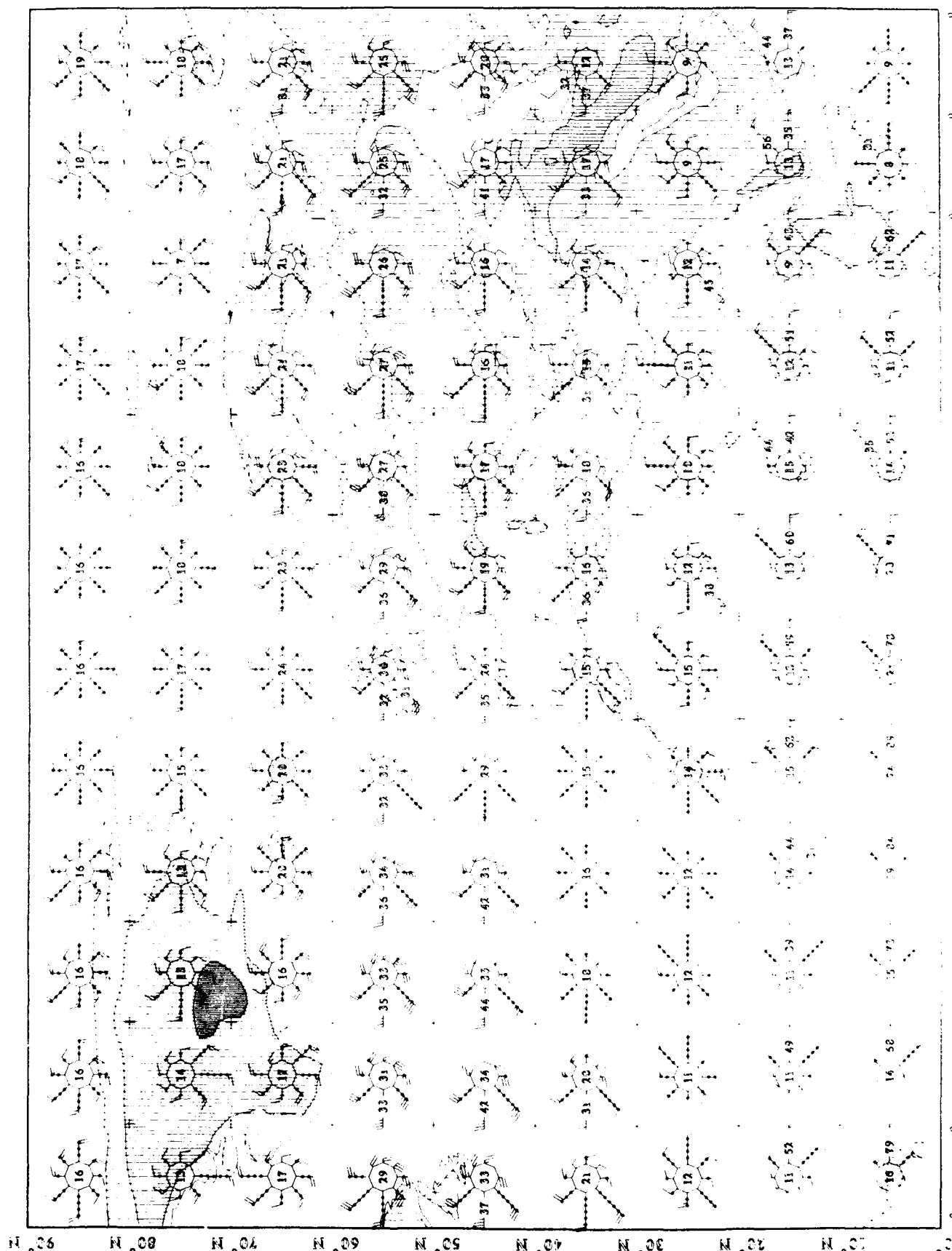


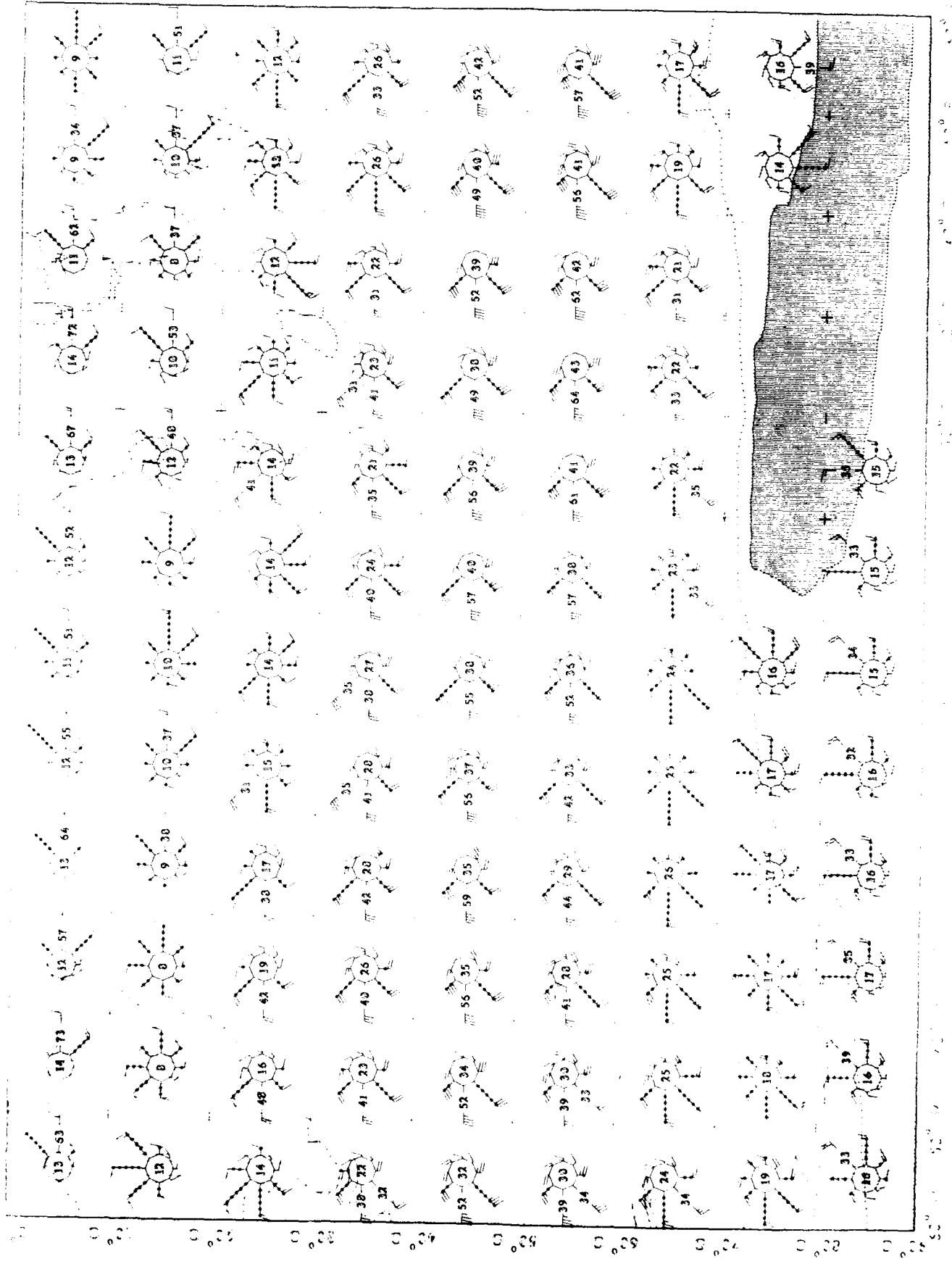
Fig. 2A. *Arachnacis* (part 2)
Montane Hemisphaeric

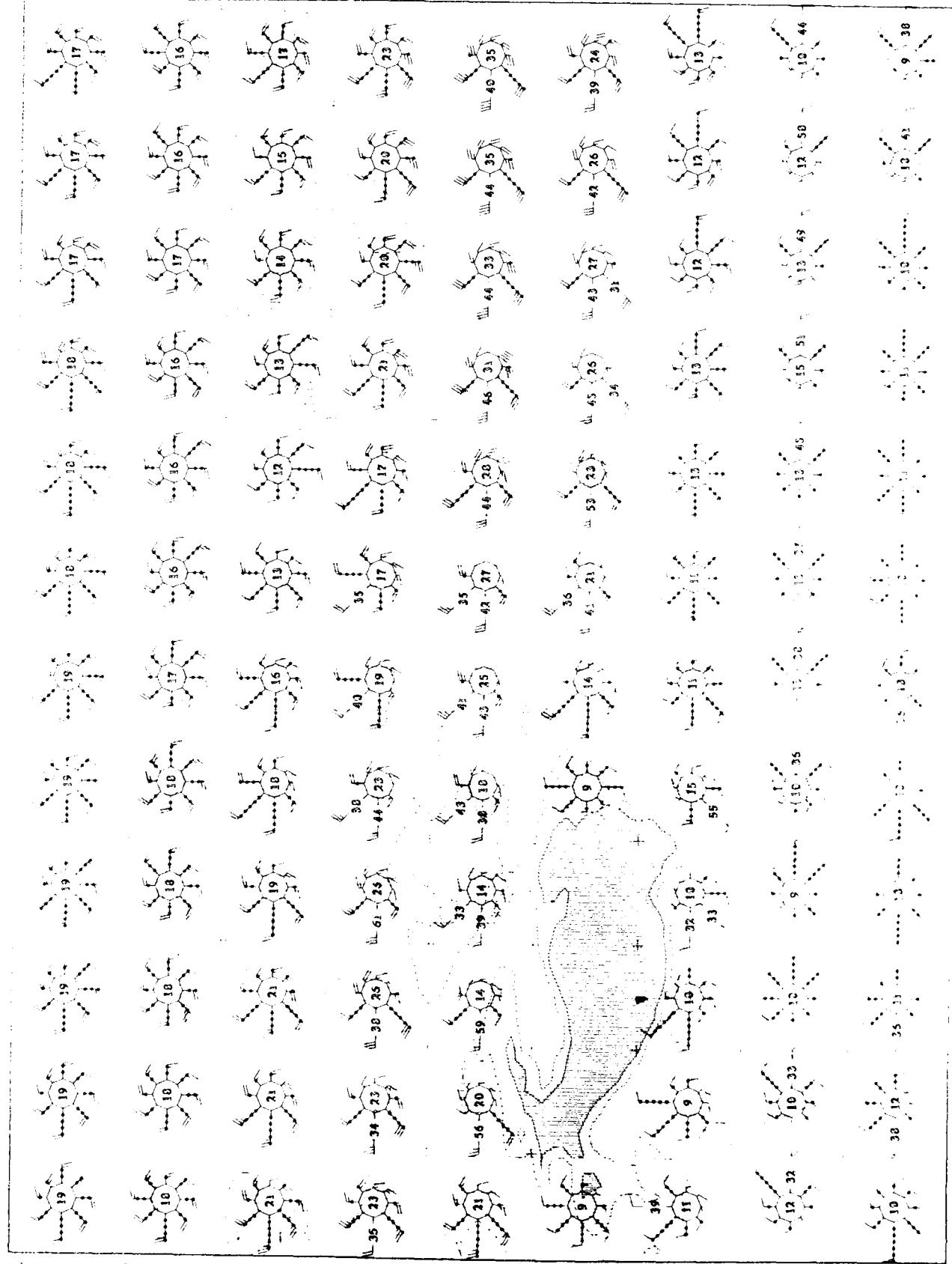
Fig. 2B. *Arachnacis*
Montane Hemisphaeric

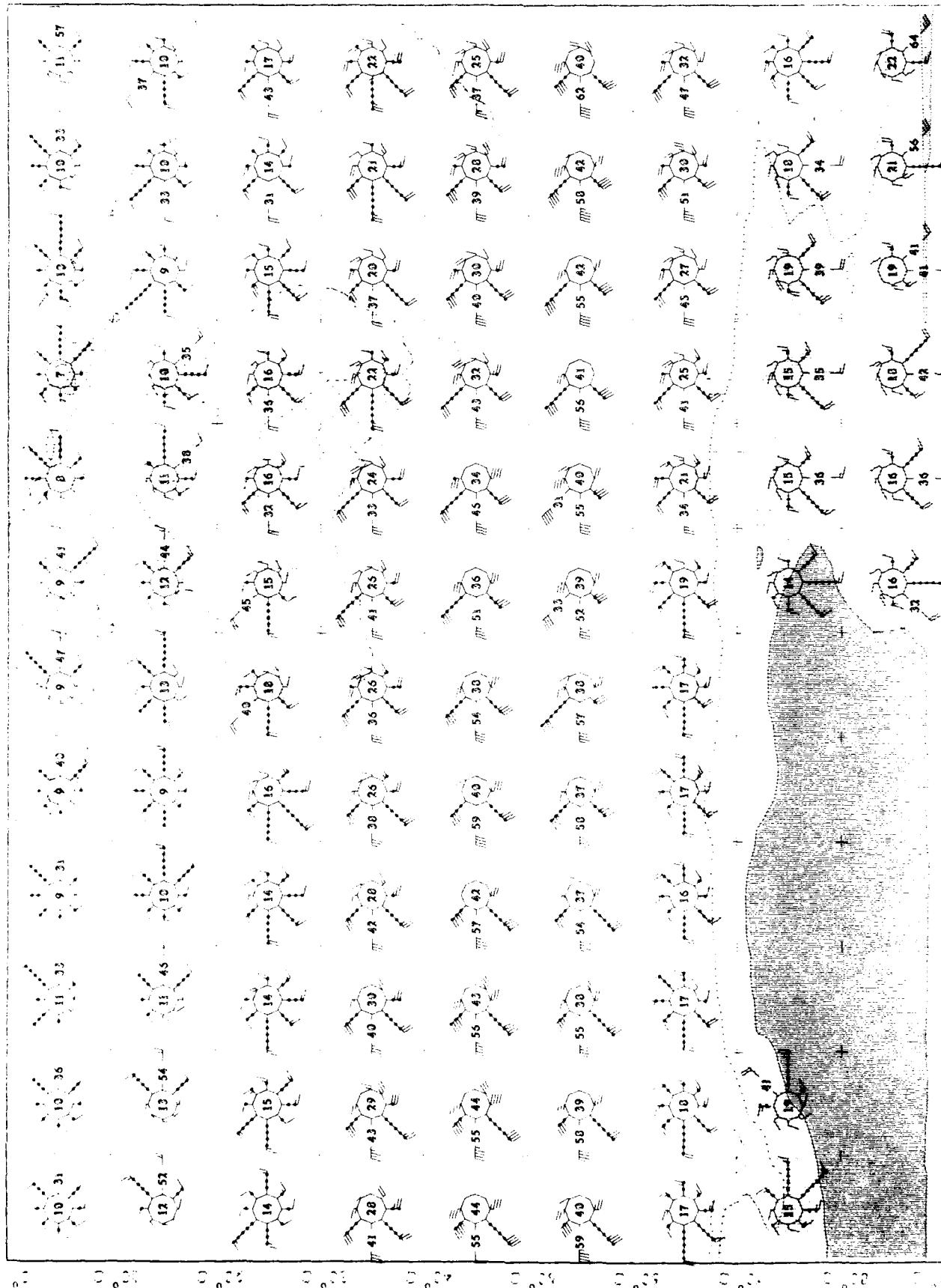


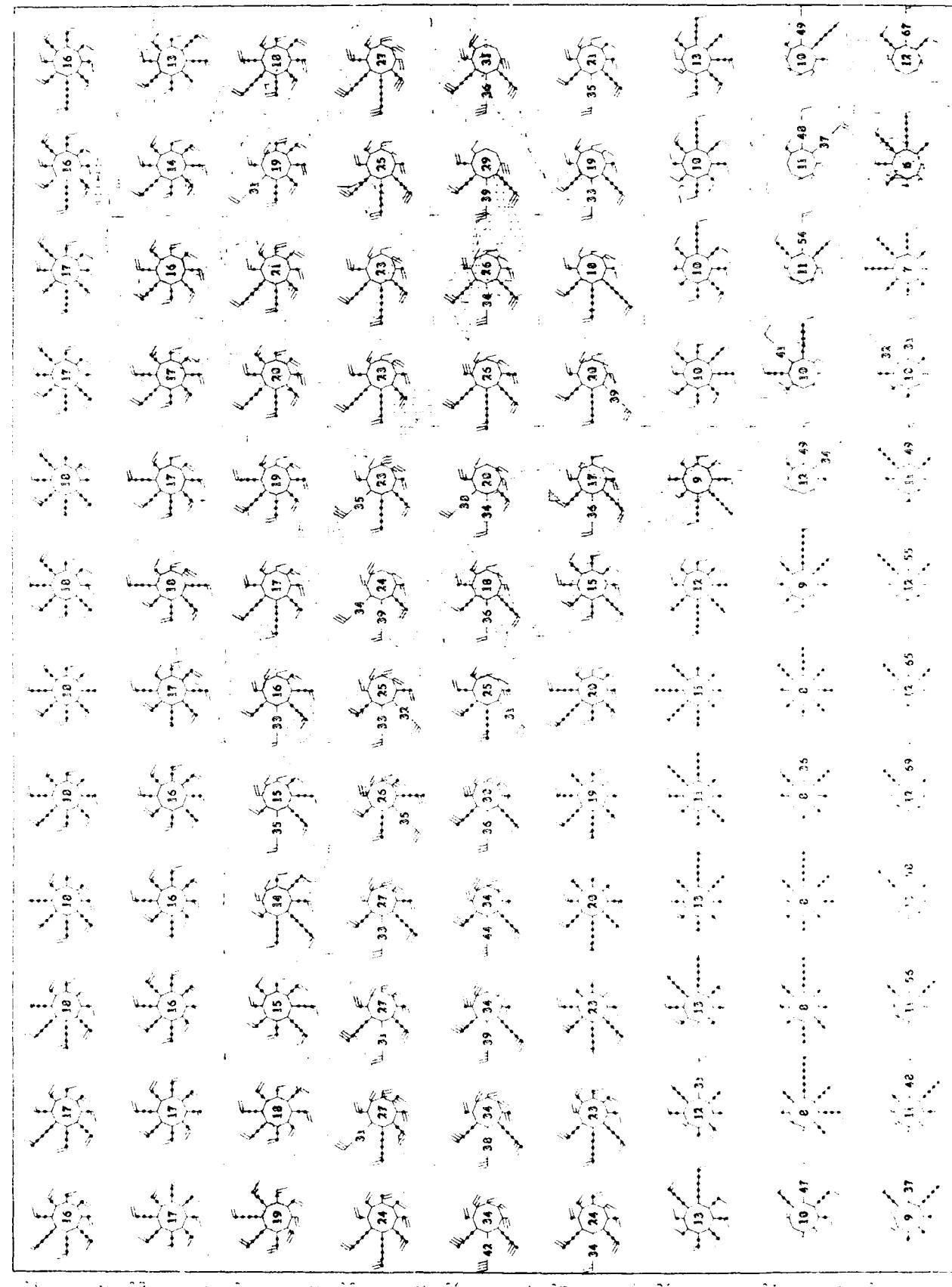


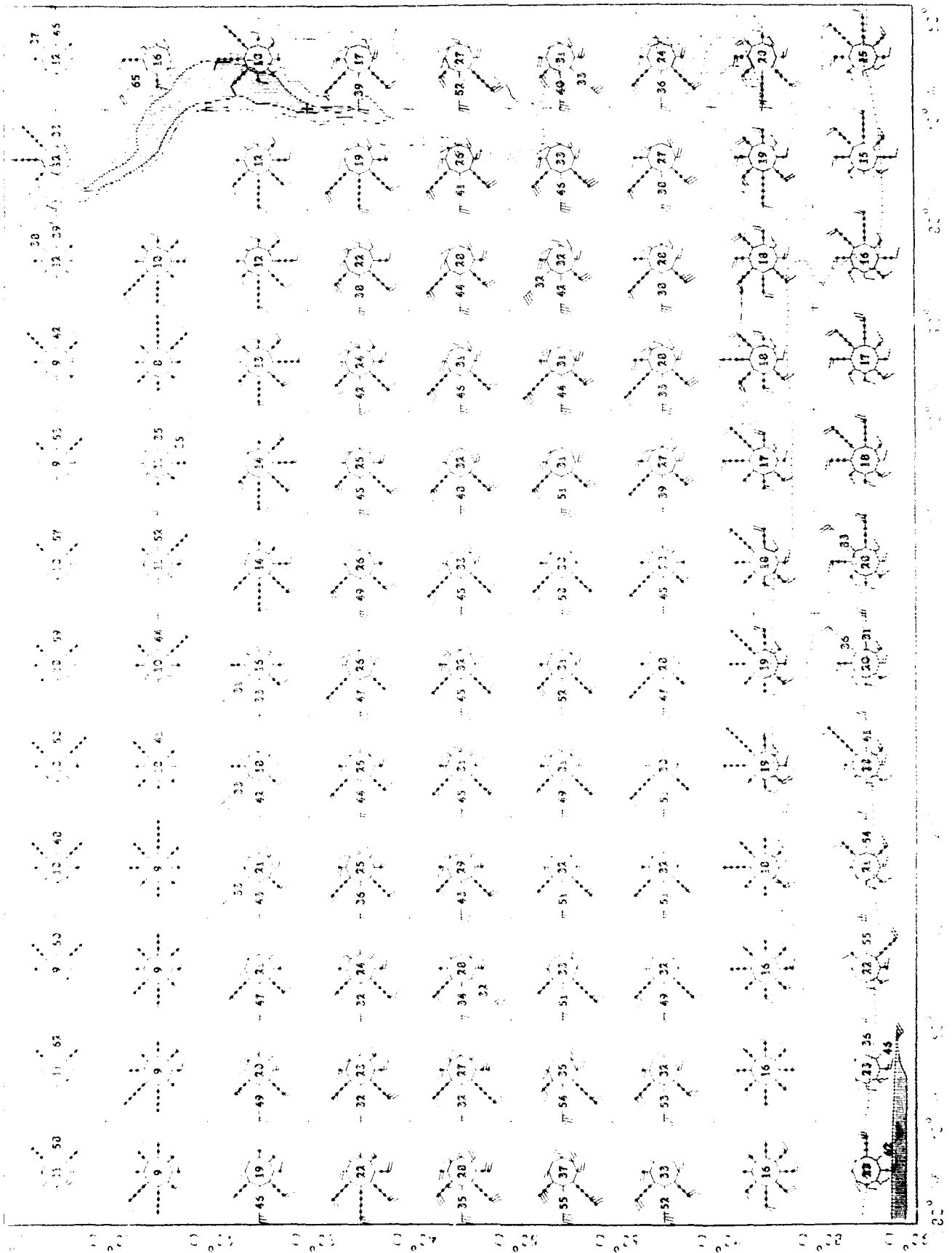


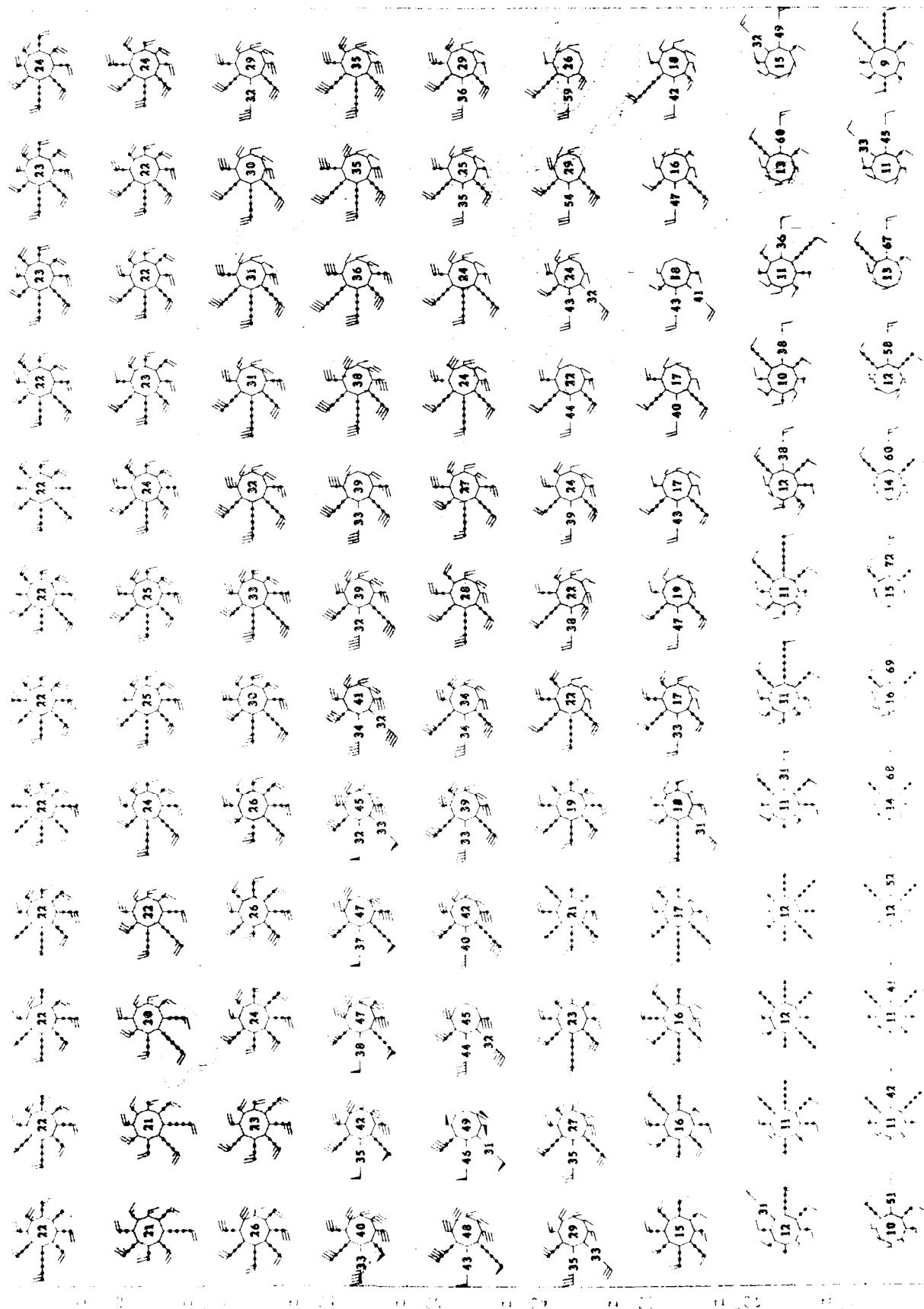


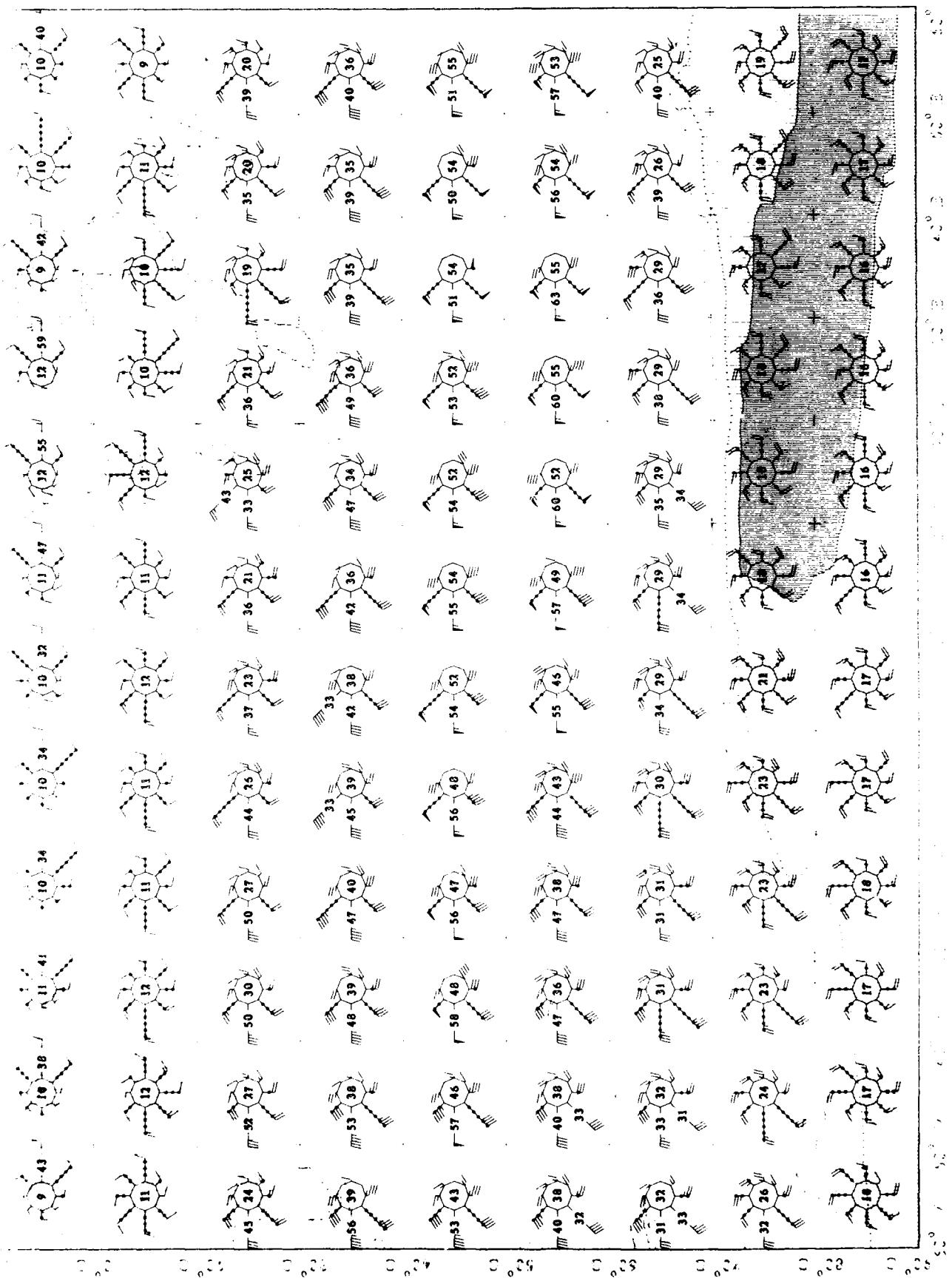






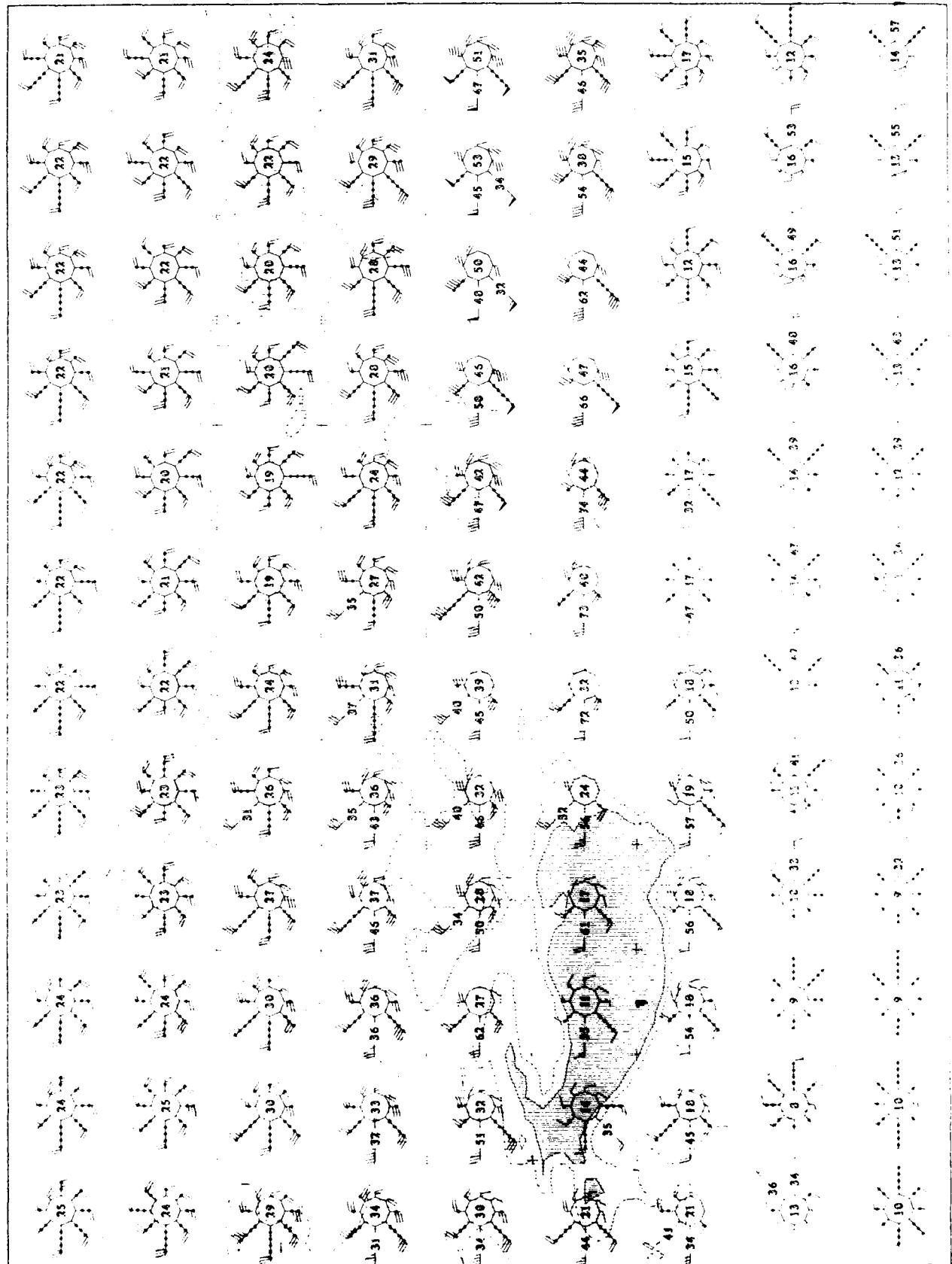


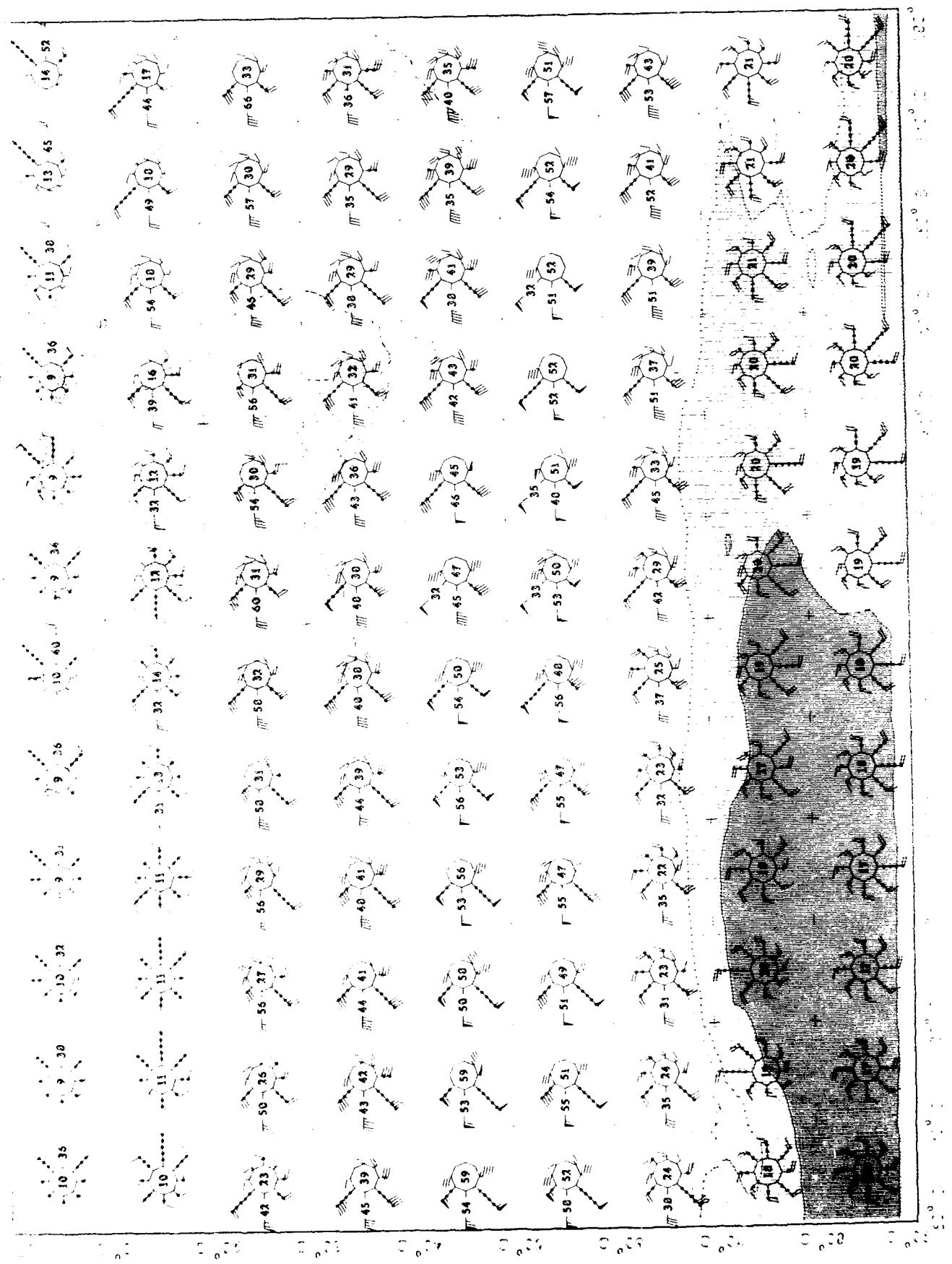




October
500 mb

Upper Air Climatology
Southern Hemisphere





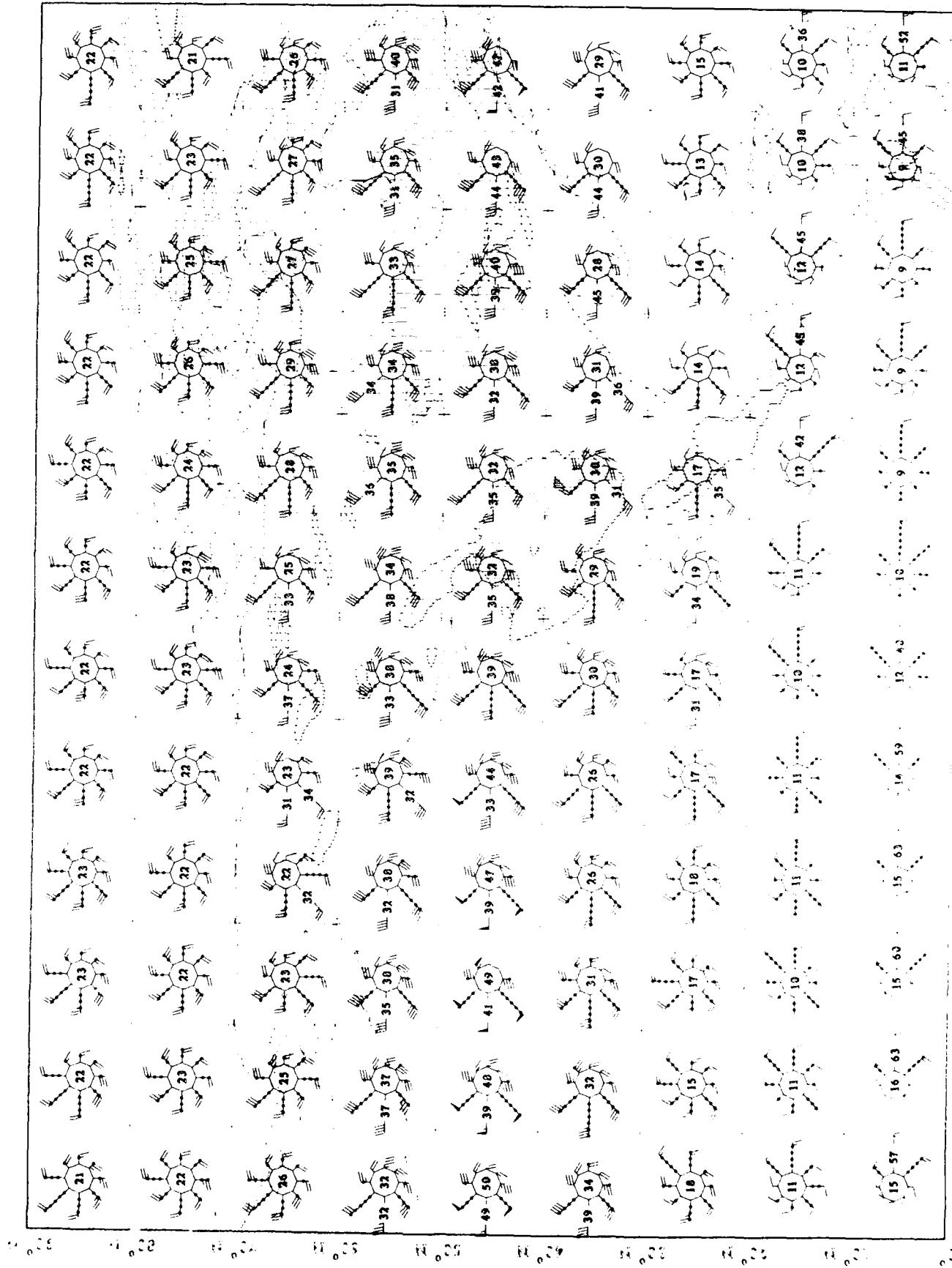
Upper Air Climatology
Southern Hemisphere

200 hPa
1970-1975

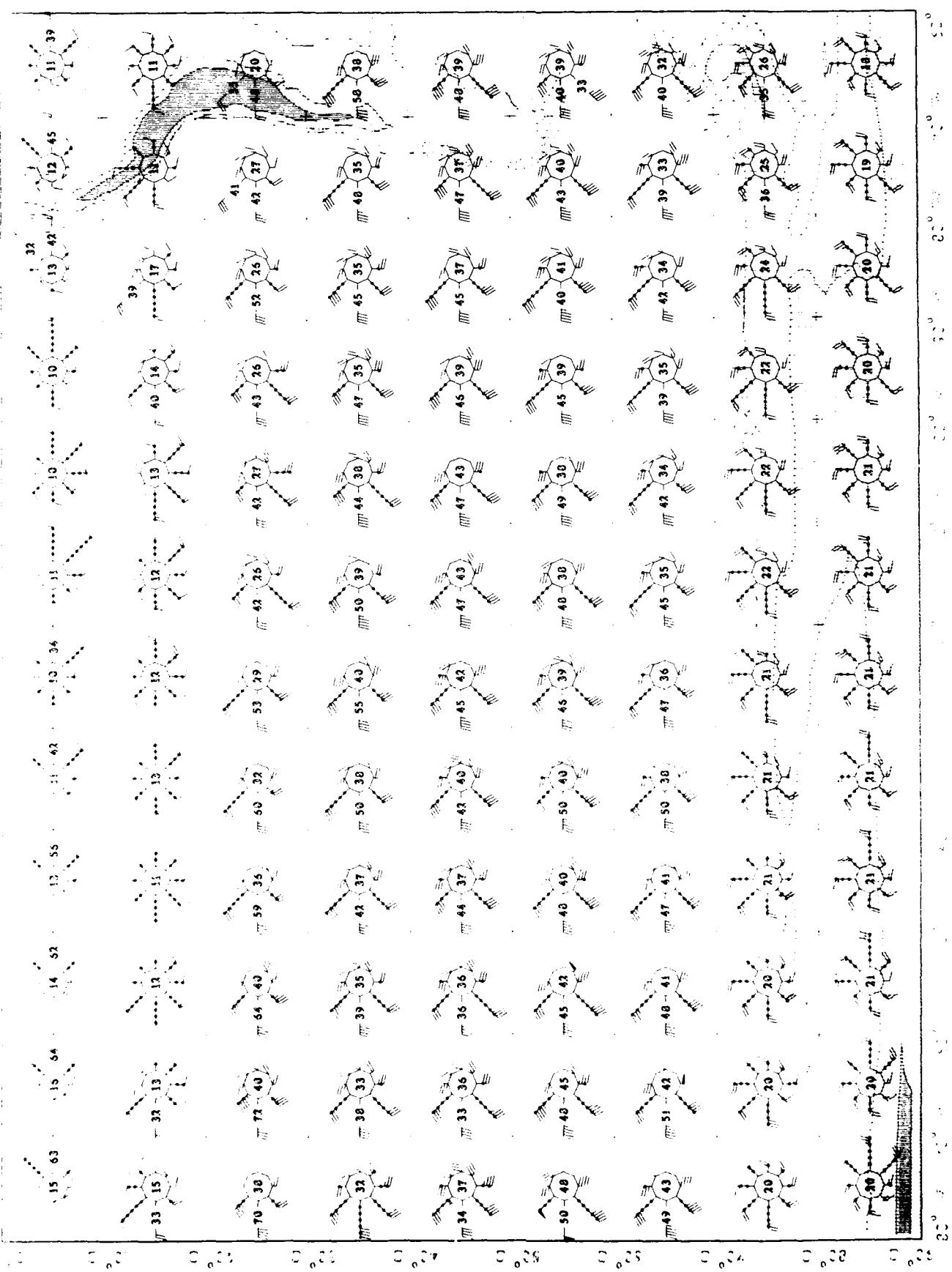
Upper Air Climatology
Northern Hemisphere

Upper Air Climatology
Northern Hemisphere

500 MB



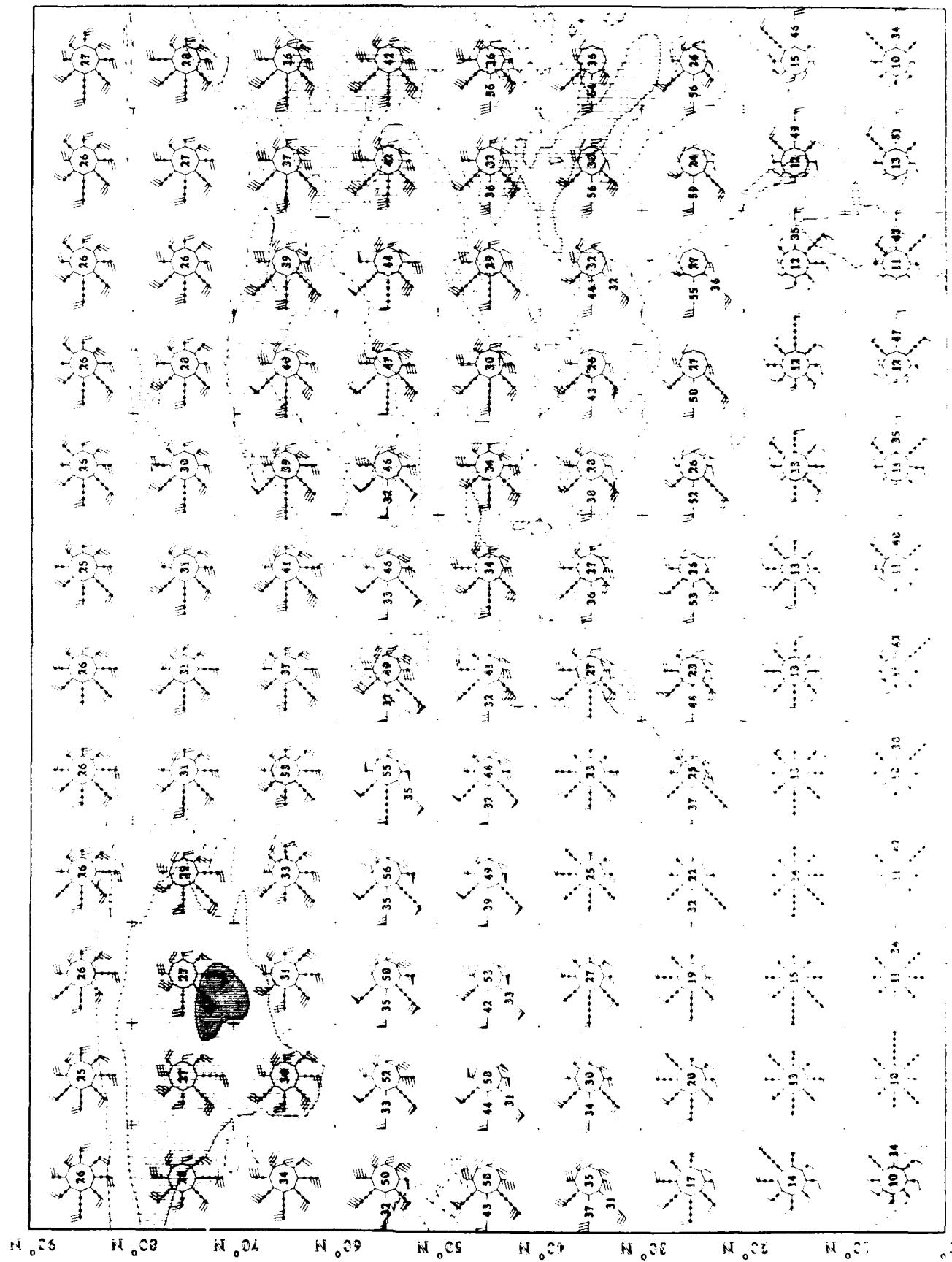
Upper Air Climatology
Southern Hemisphere

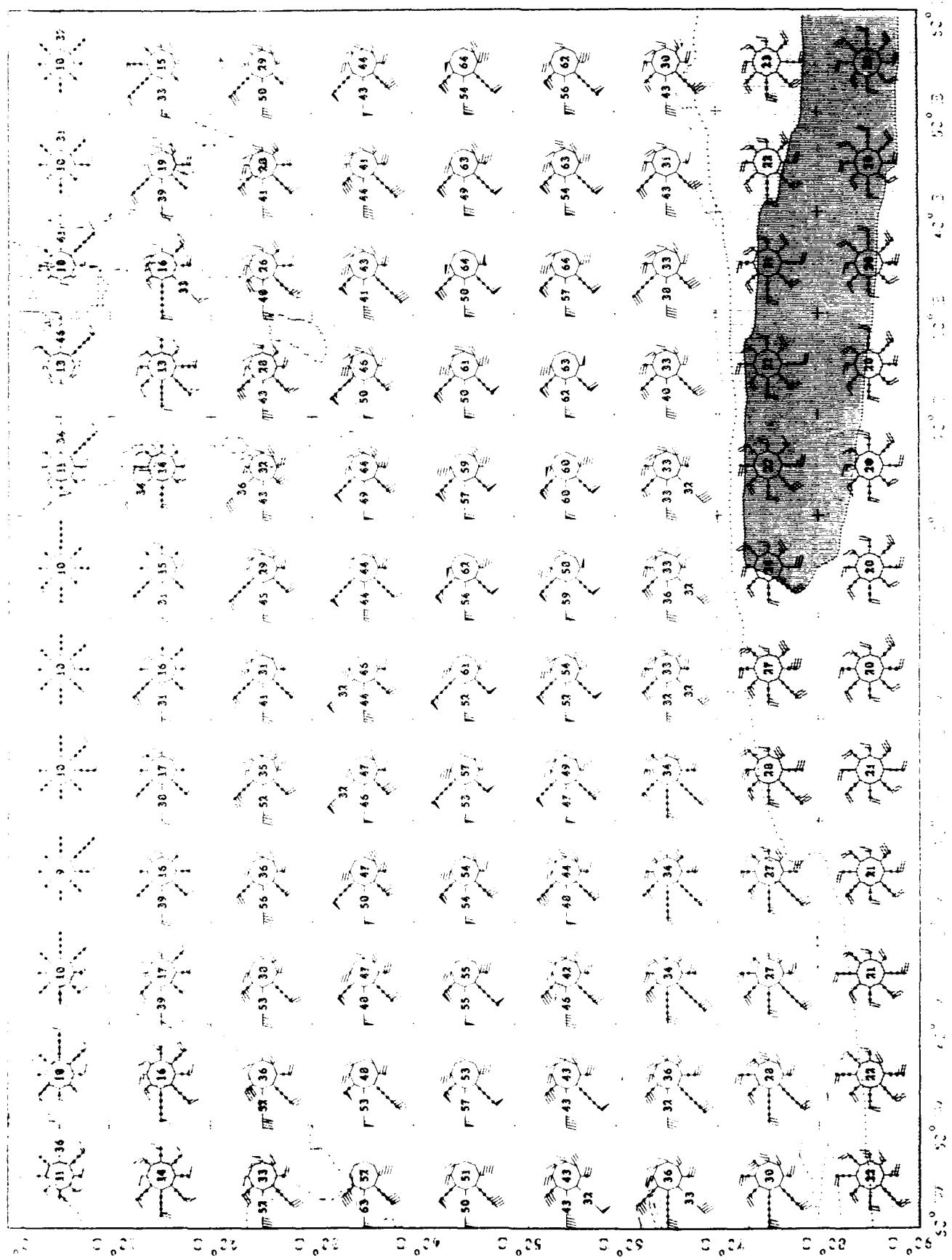


October
500 mb

Fig. 2. Mean Concentrations
Northern Hemisphere

1950-51
1951-52
1952-53



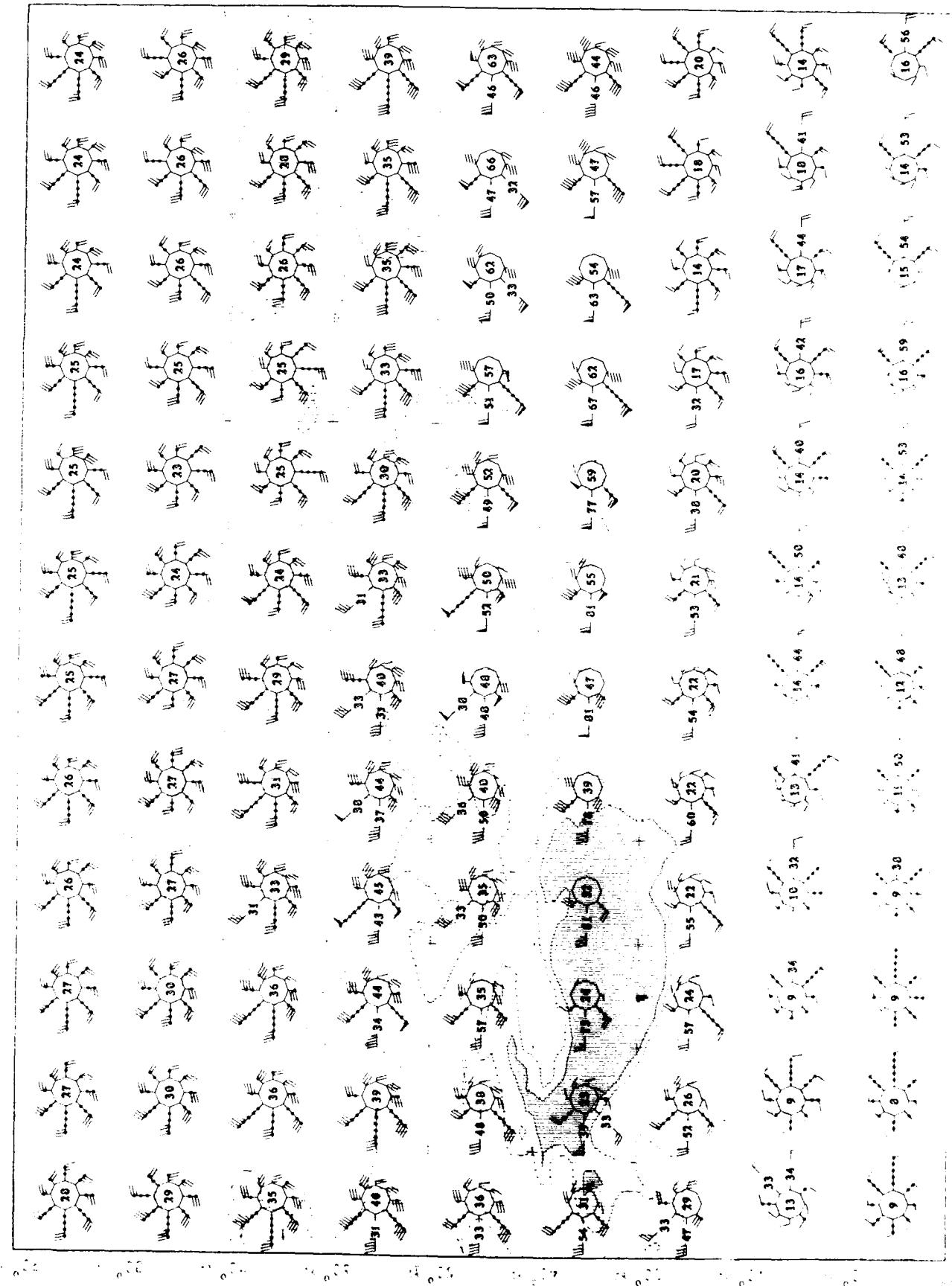


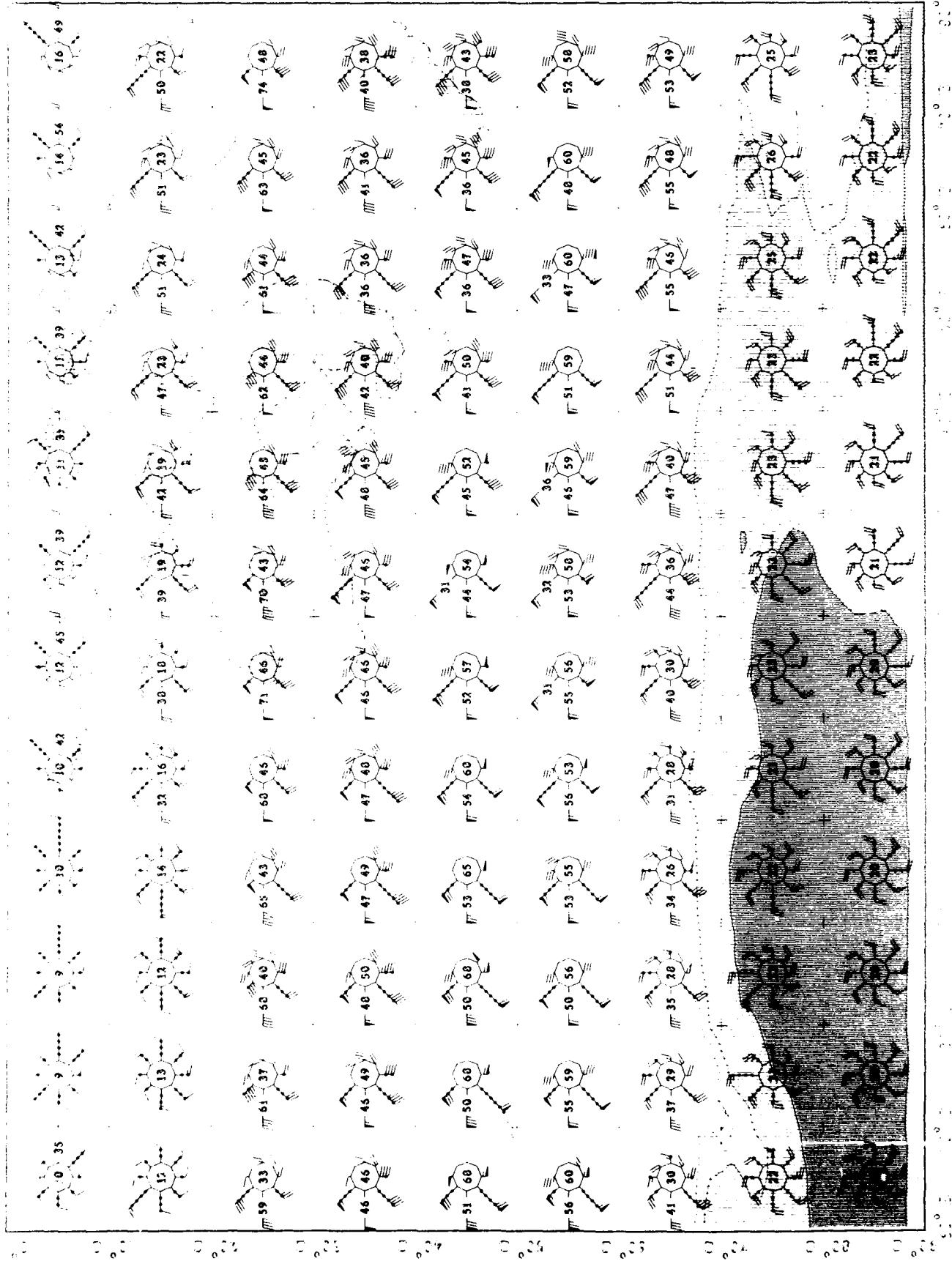
1950-51
4000
1951-52
4000

卷之三

卷之三

Upper and Lower Northern Hemisphere





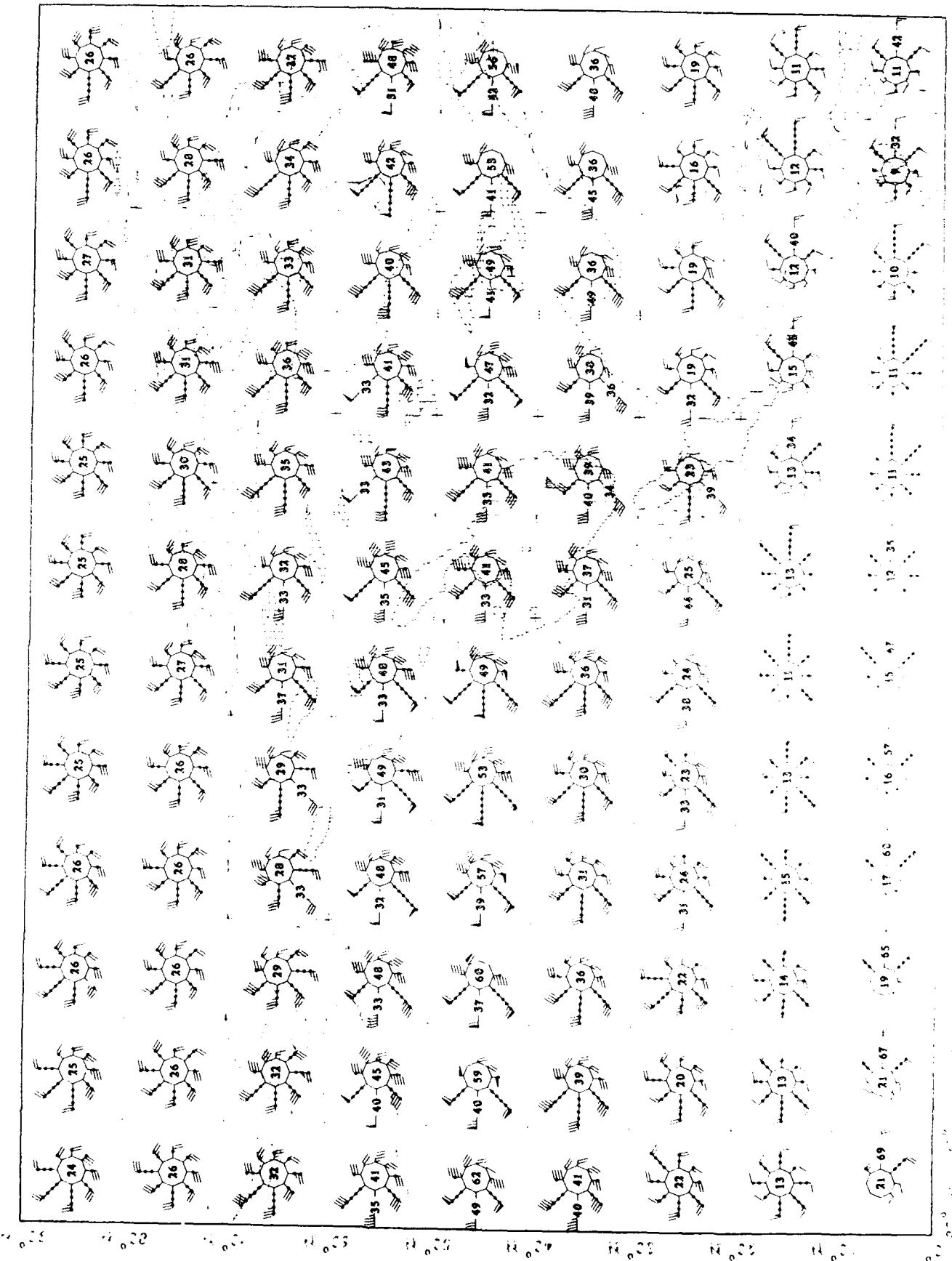
Upper Air Climatology
Southern Hemisphere

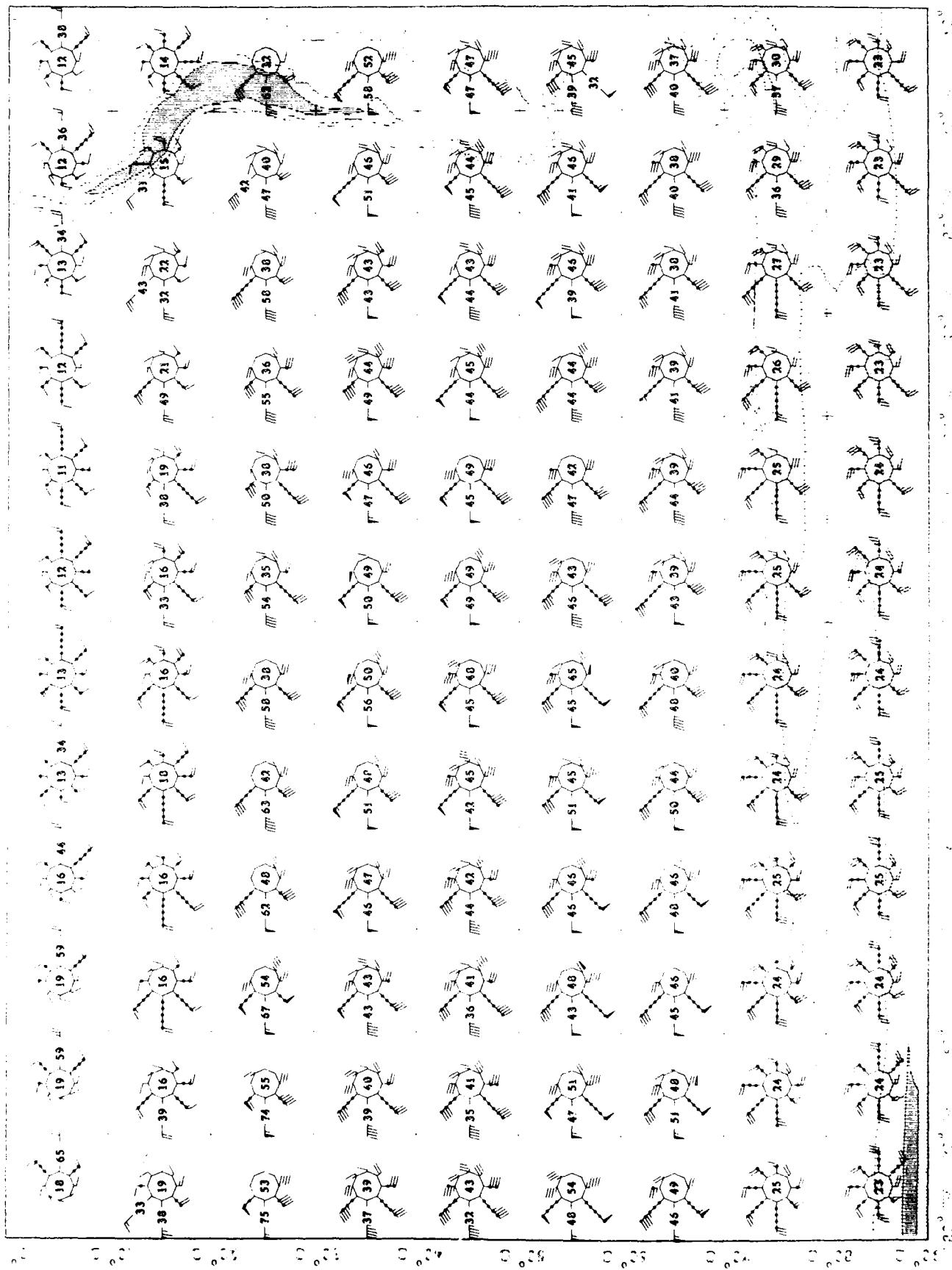
© C.G.S.C.
4000 MB

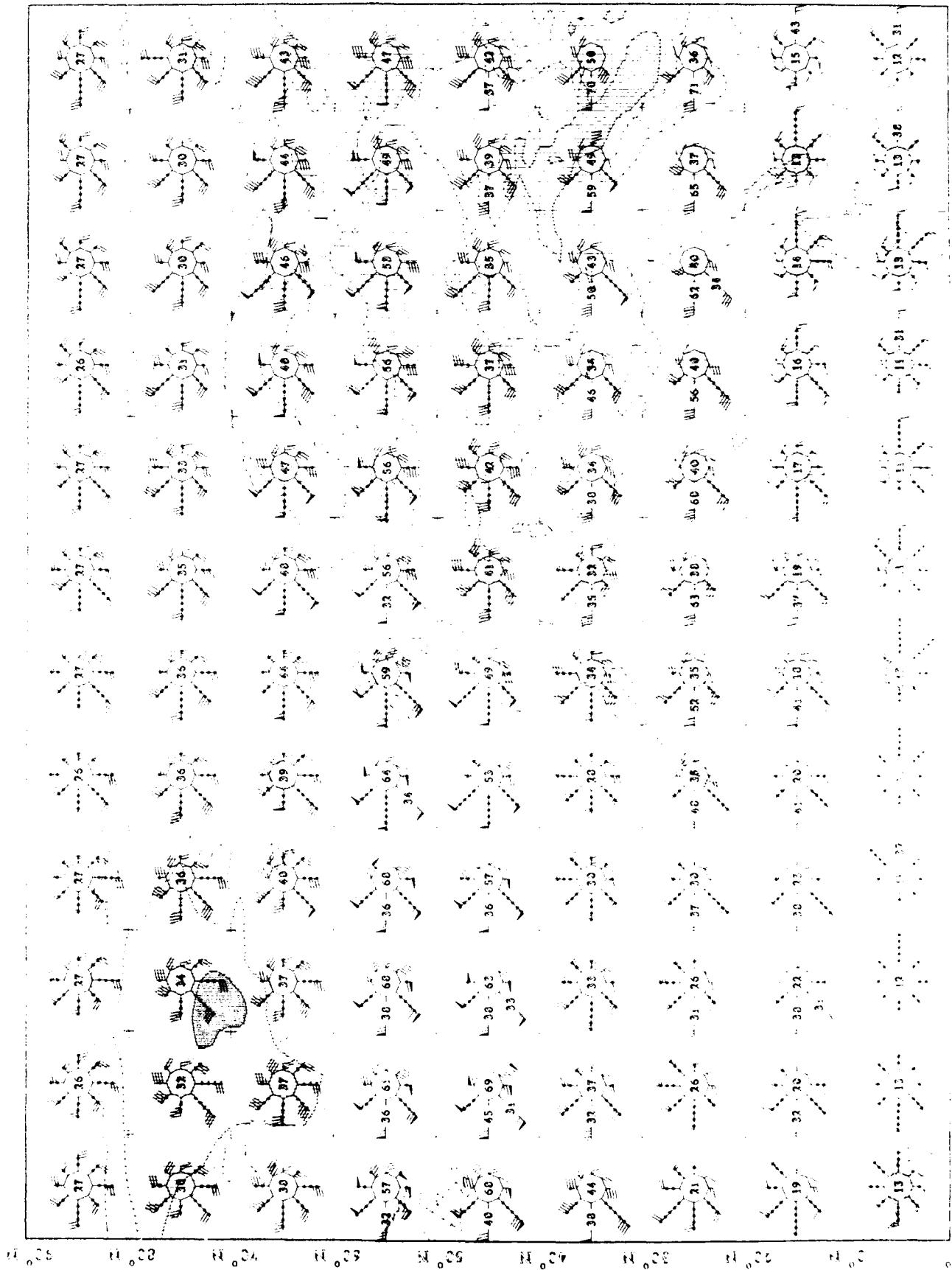
40° N

30° S

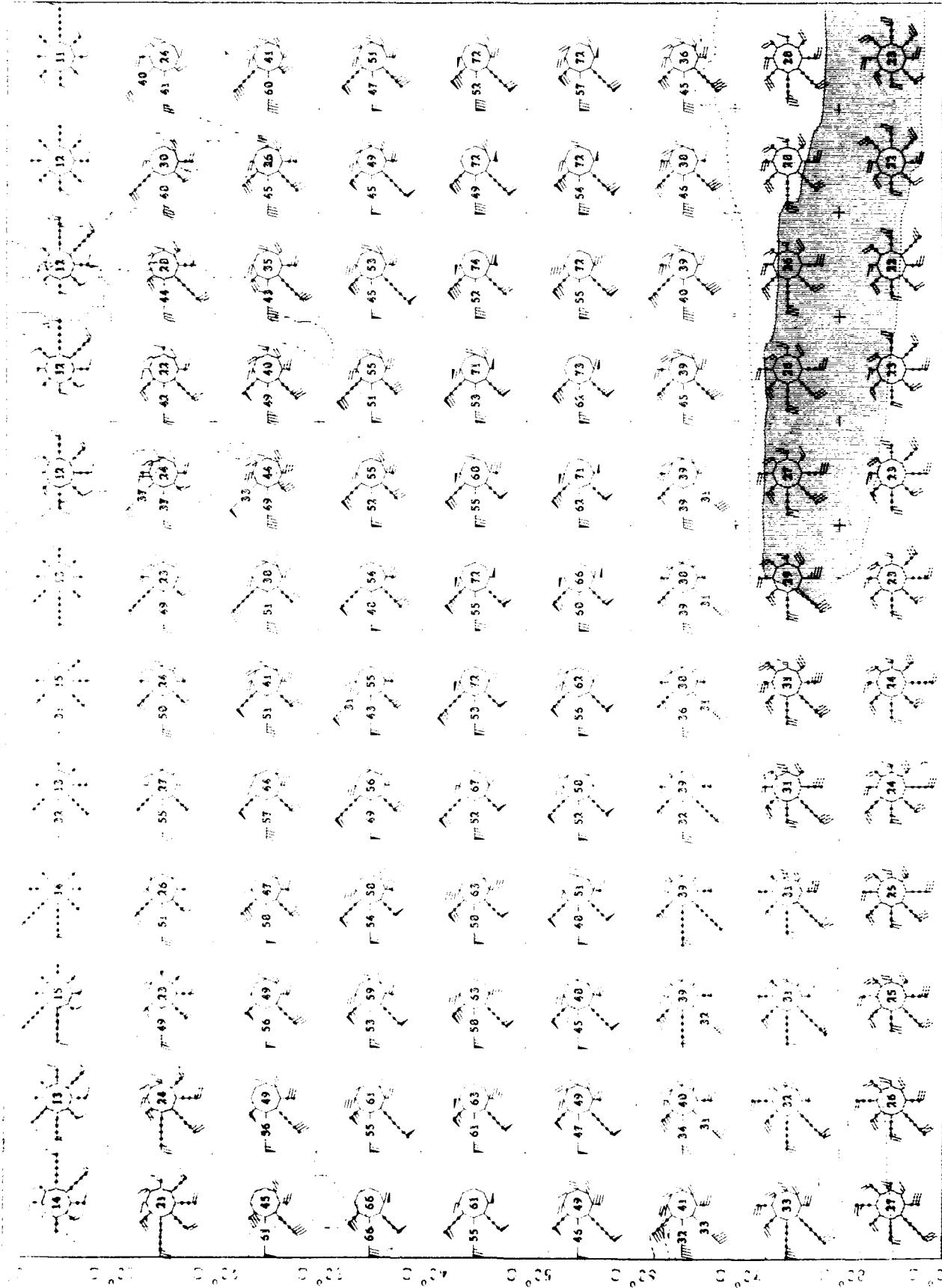
20° S
Latitude
Northern Hemisphere

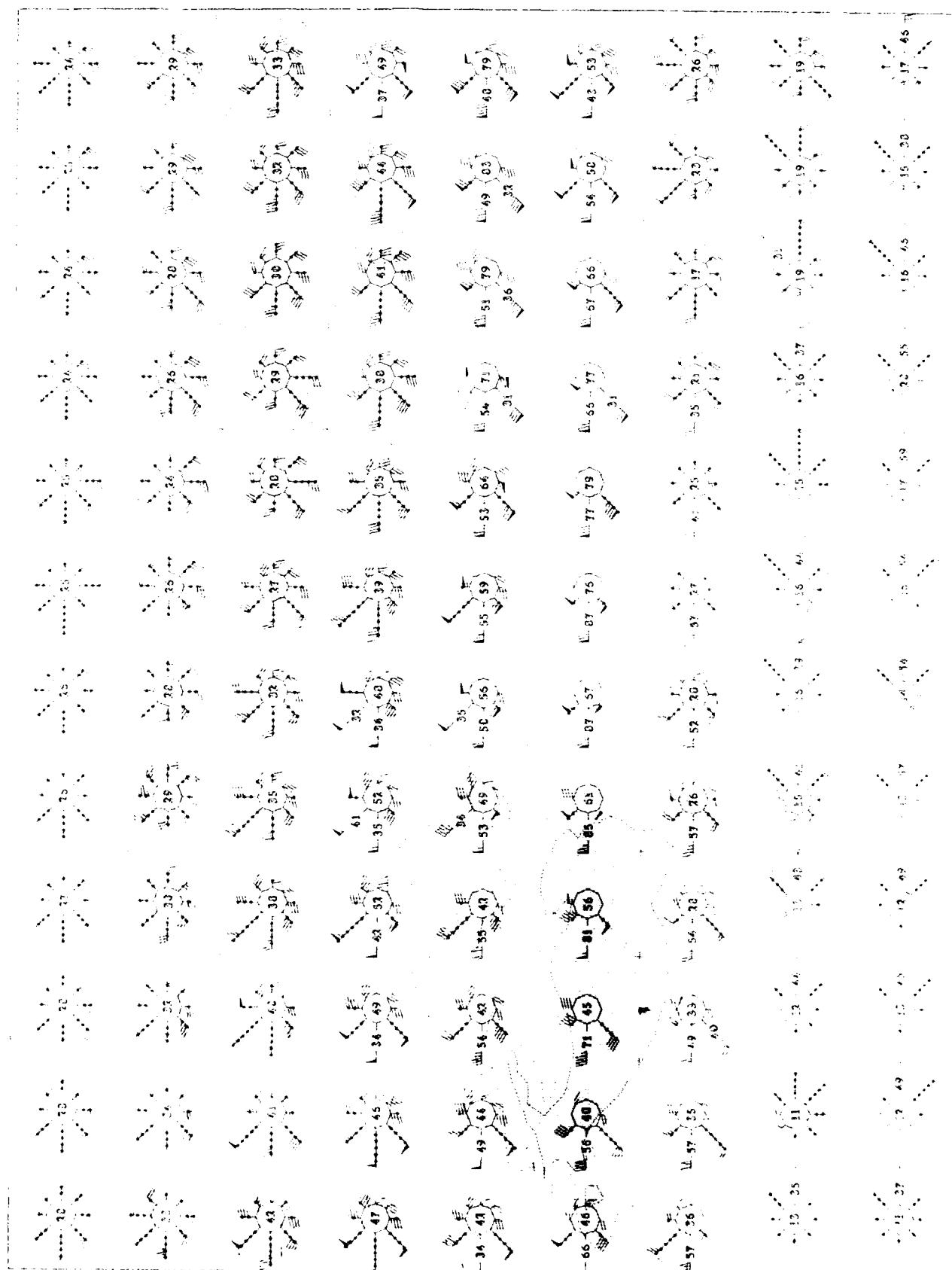






N° 25 N° 28 N° 24 N° 23 N° 29 N° 27 N° 26 N° 22 N° 20 N° 2





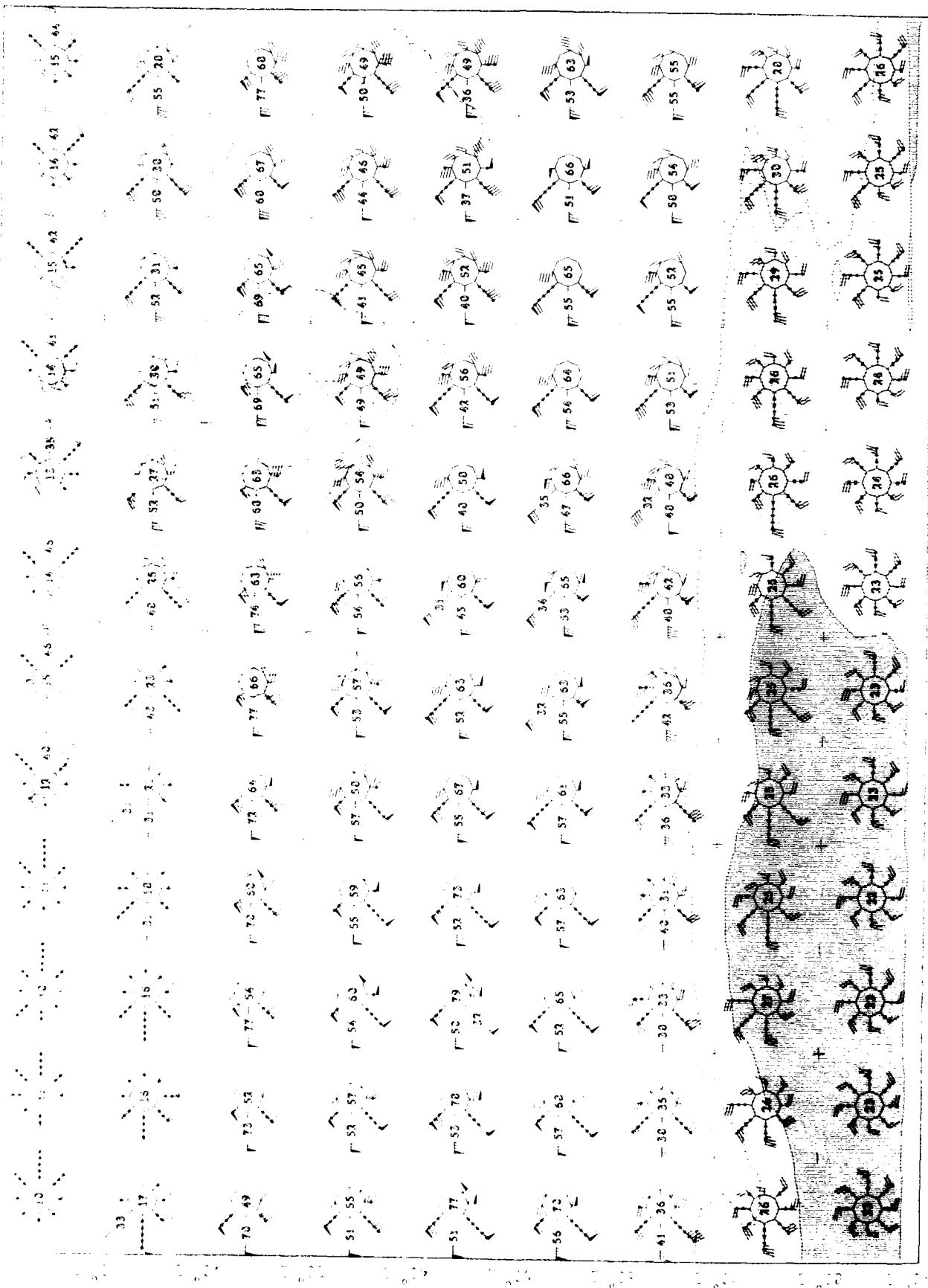
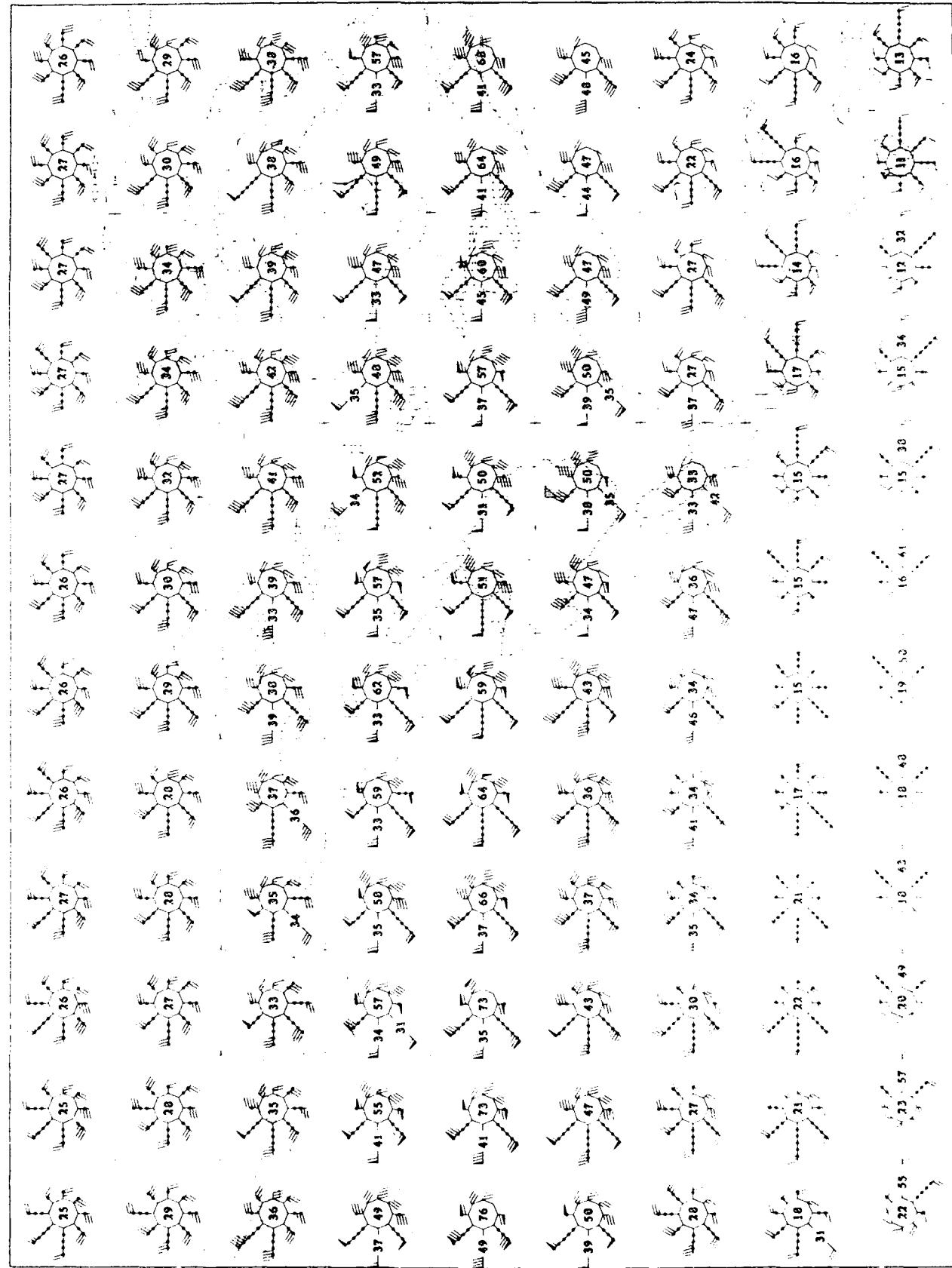
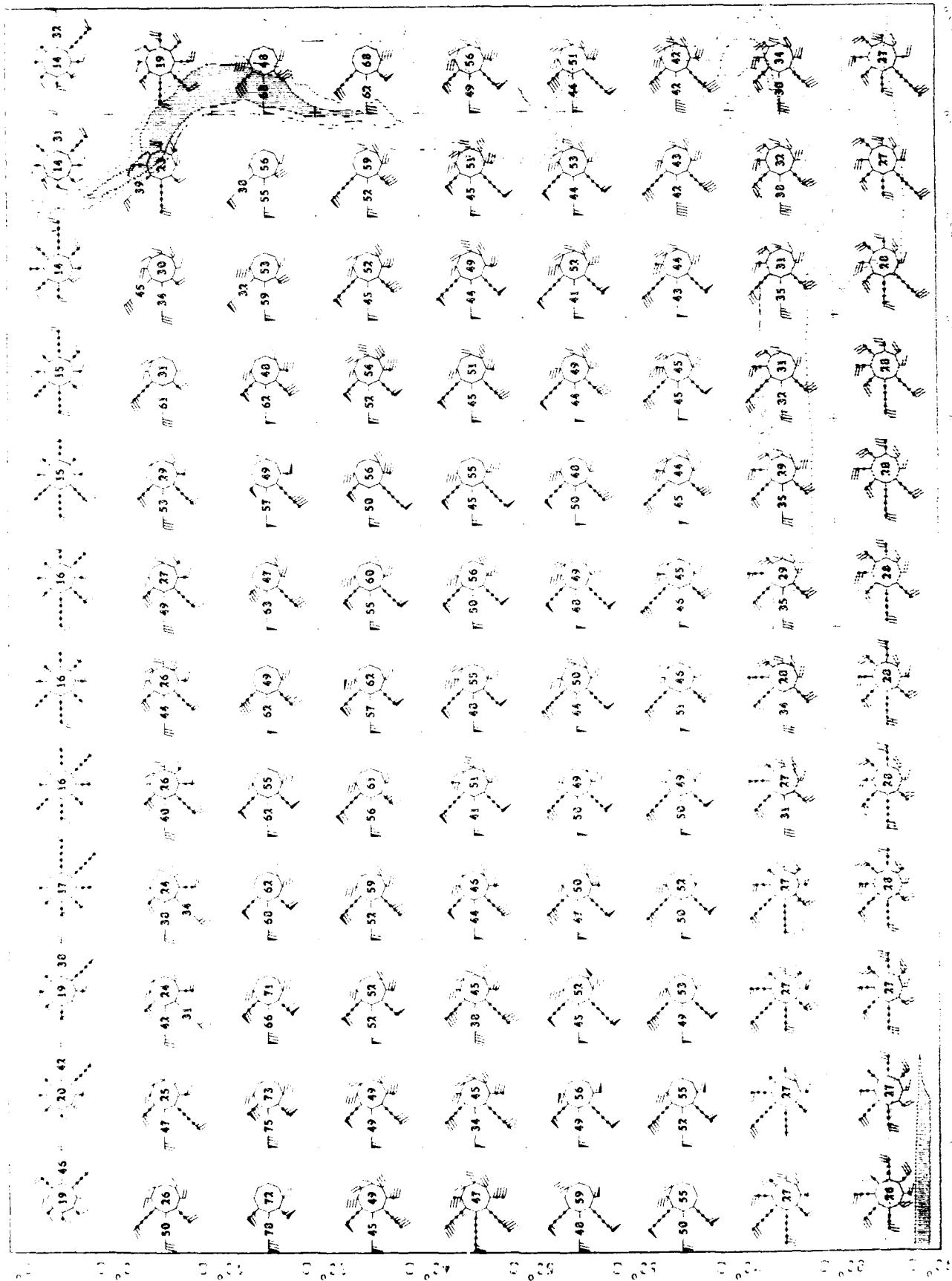


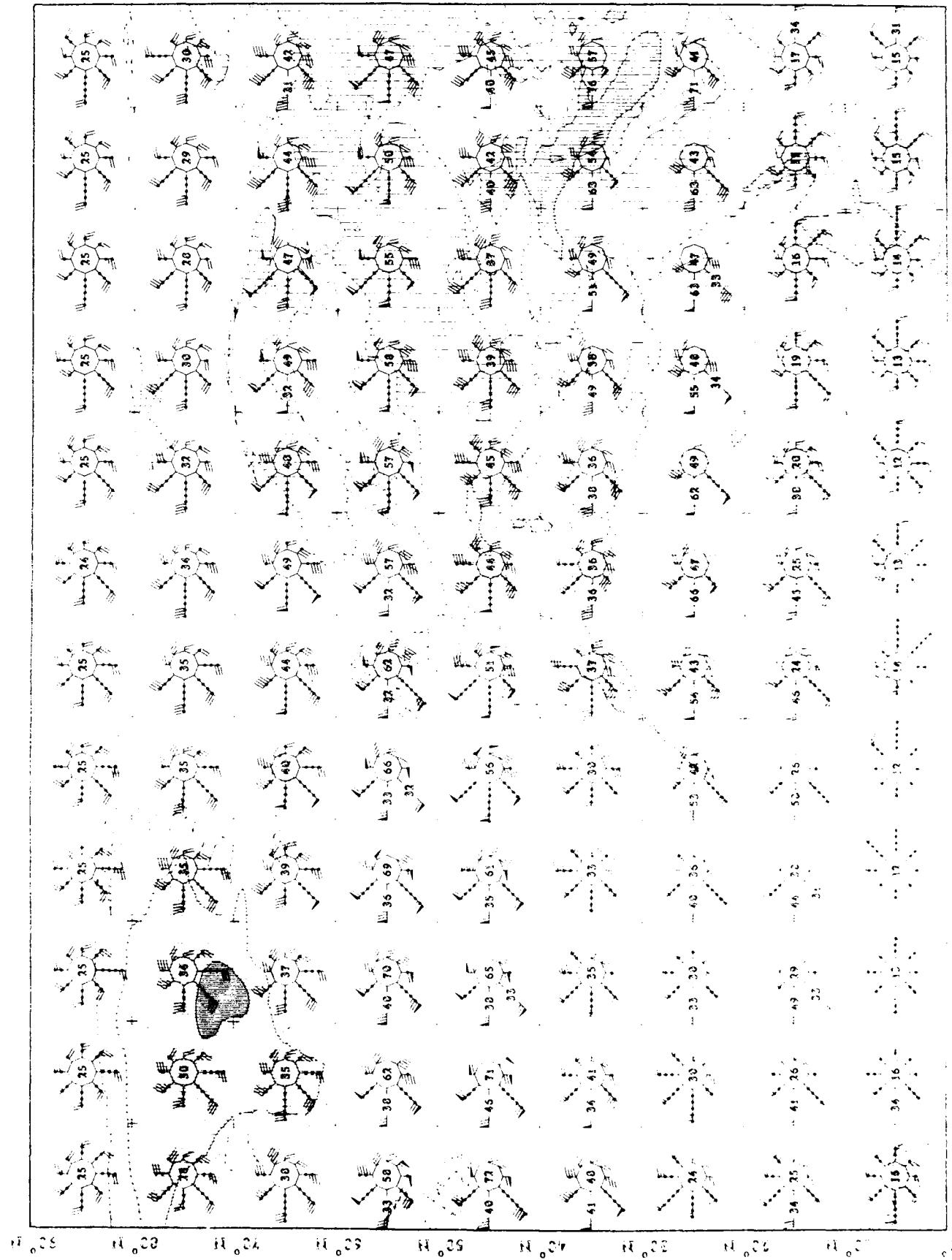
Fig. 2.3. Areal Climatology
Northern Hemisphere

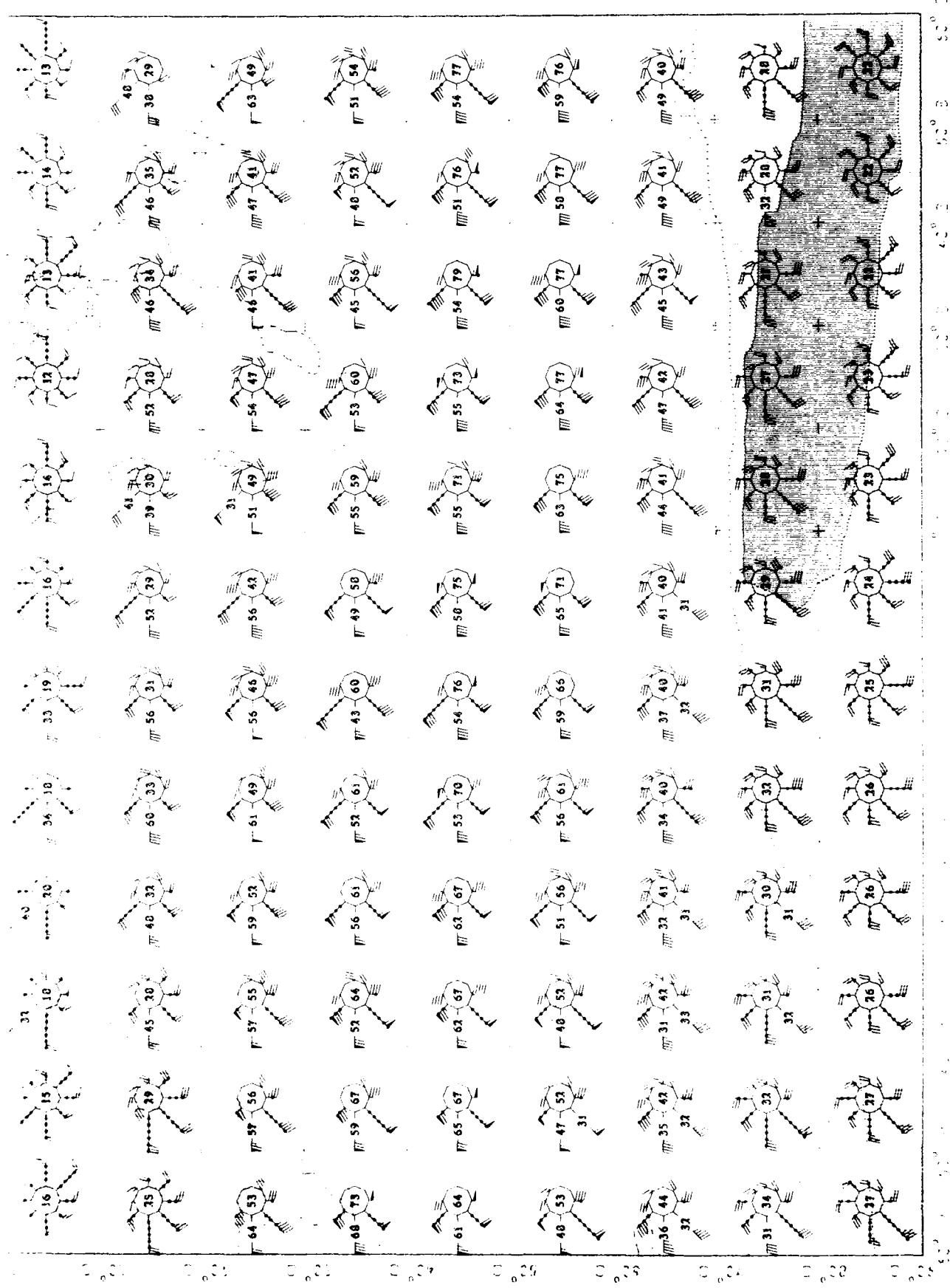




Map of All Countries &
Northern Hemisphere

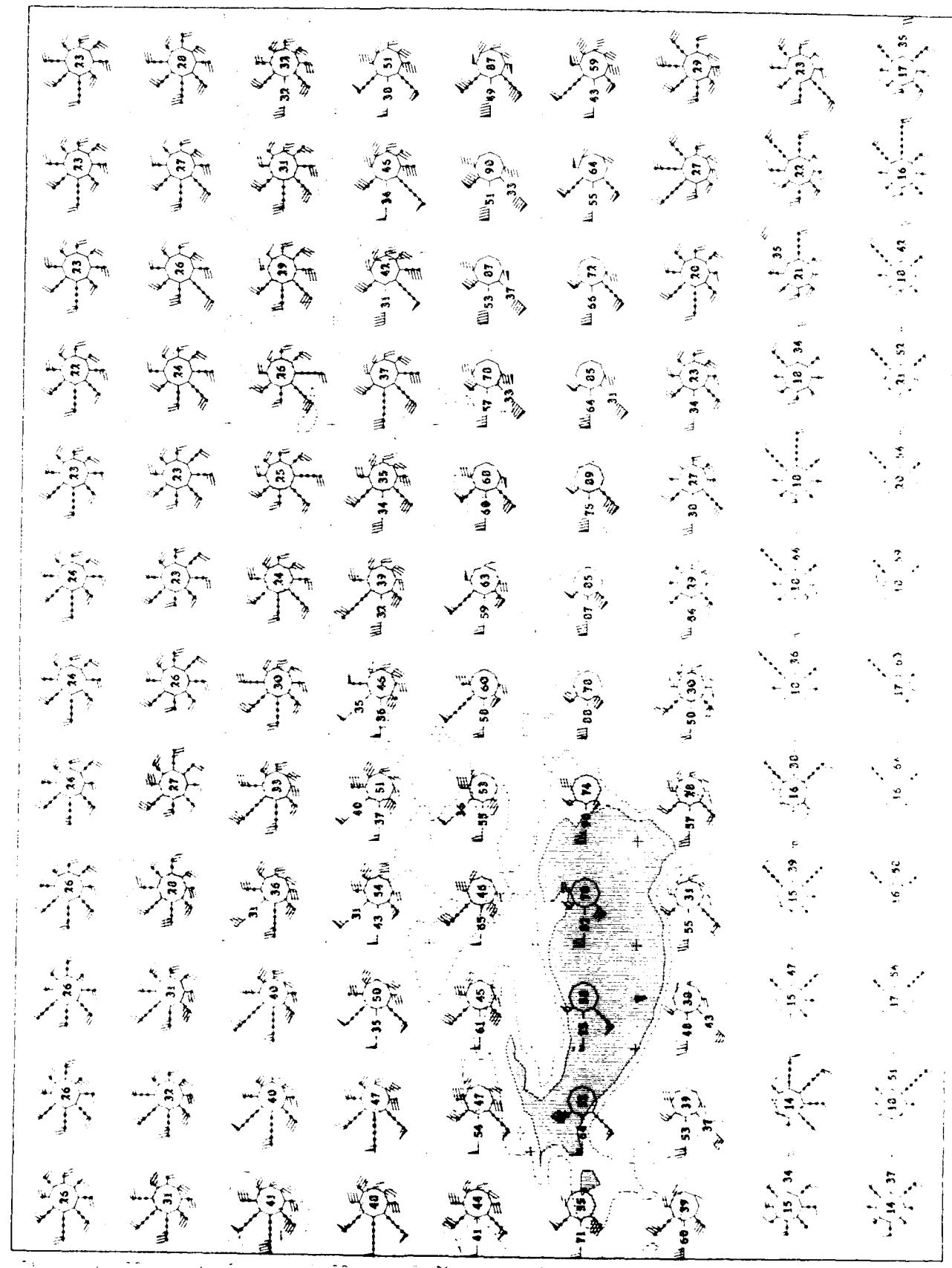
1945
1946

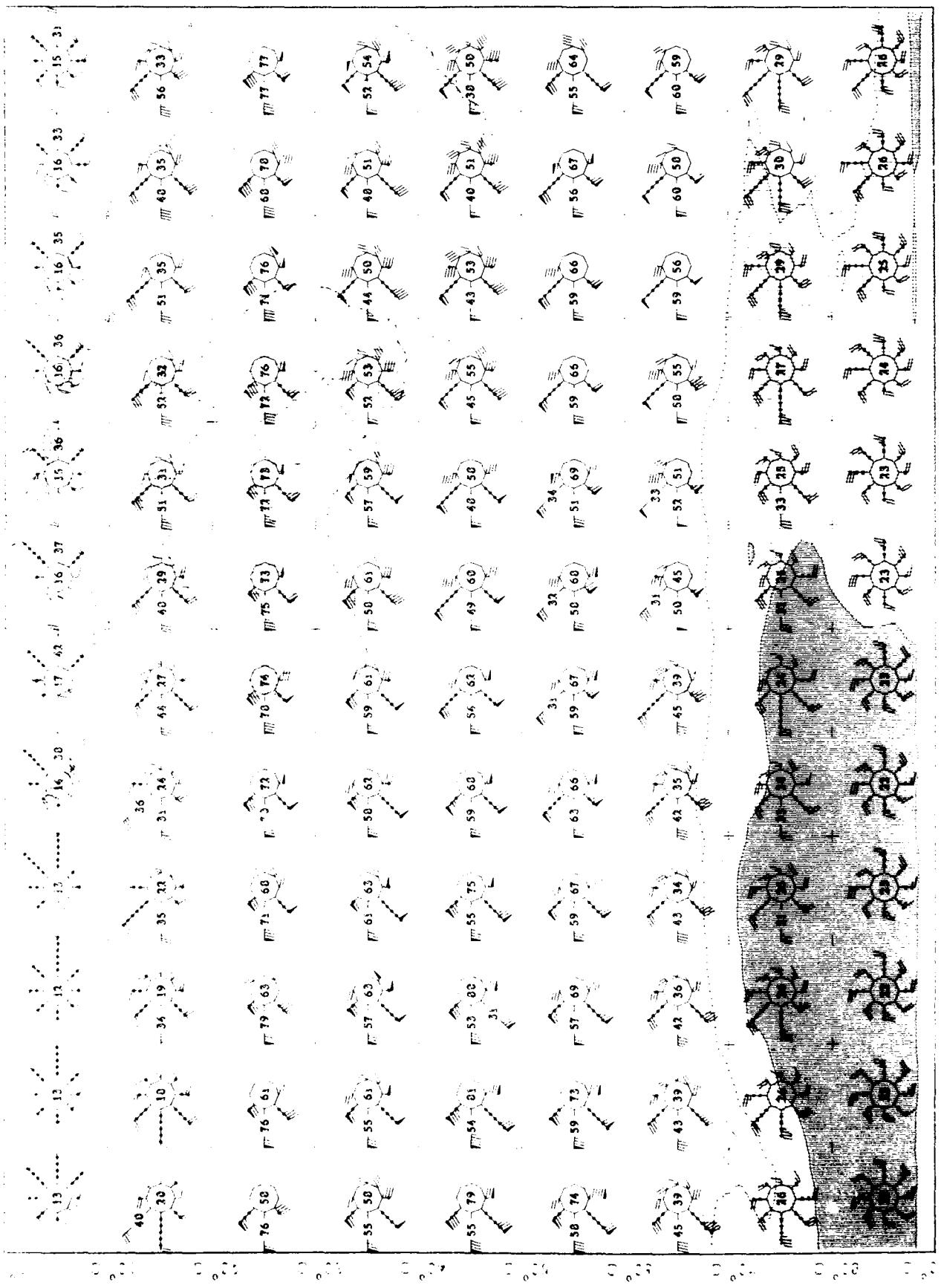




卷之三

Northem. Hemisphere

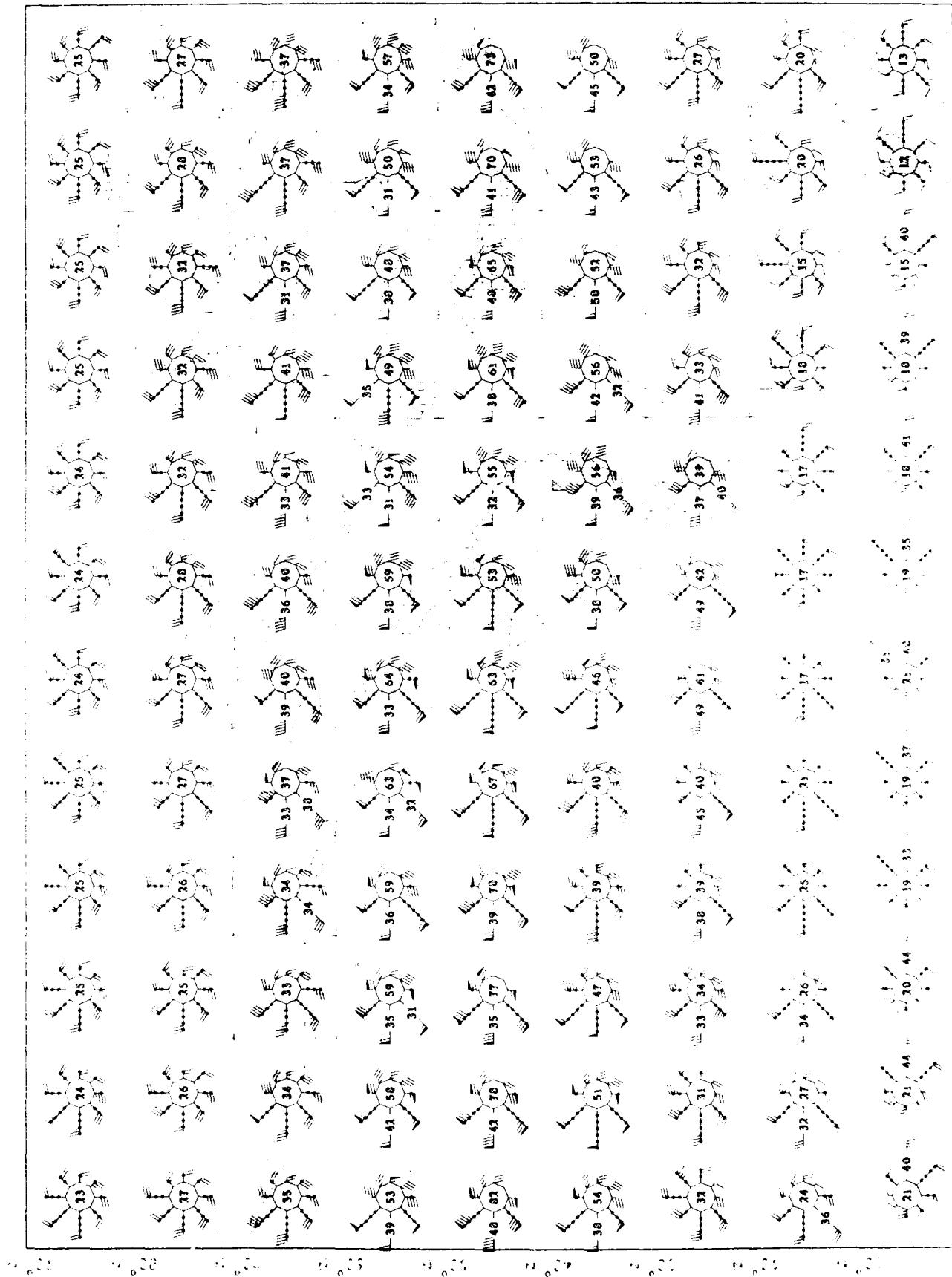


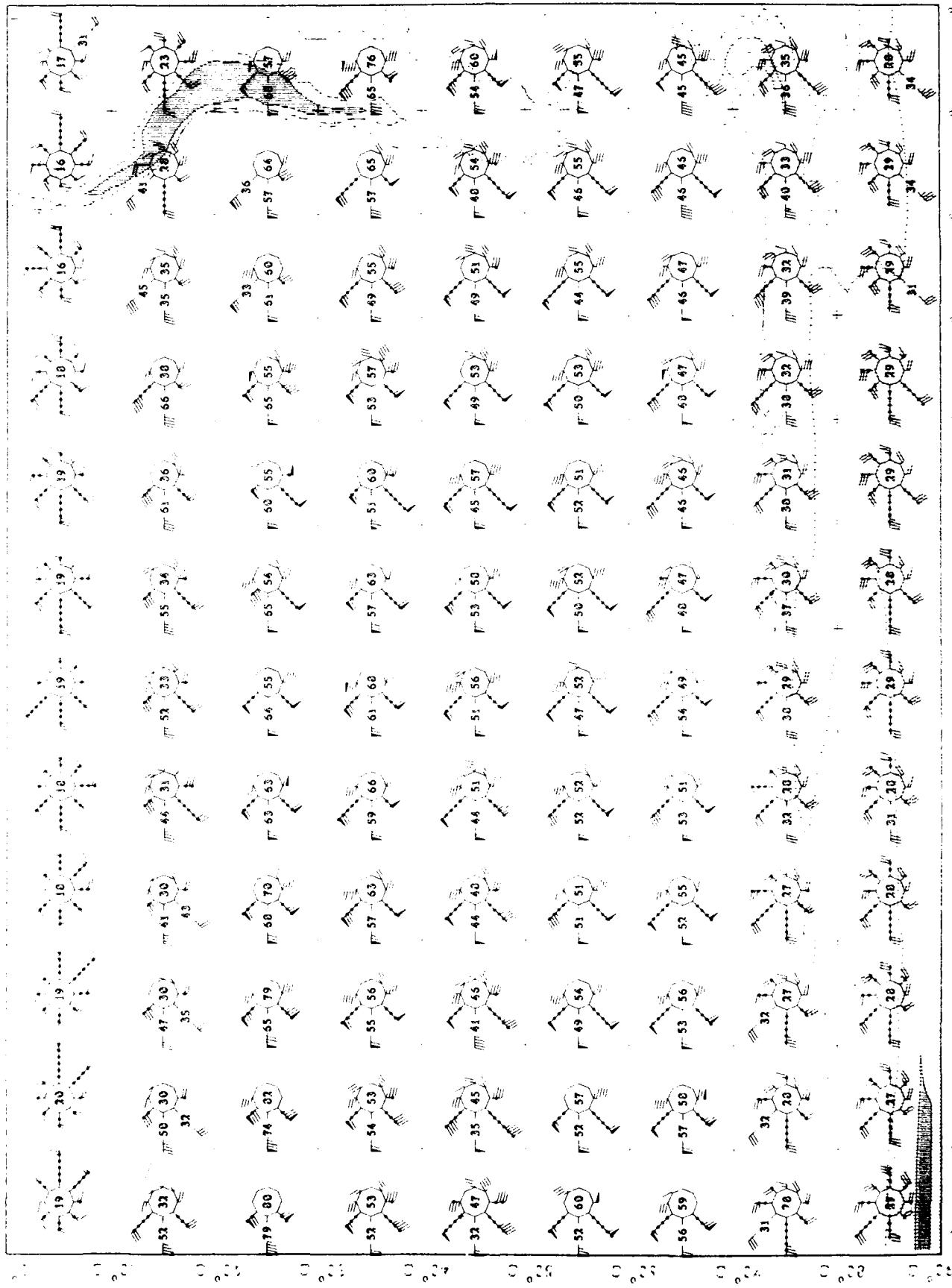


Geological
Survey

U.S. Geol. Survey
Circular 220

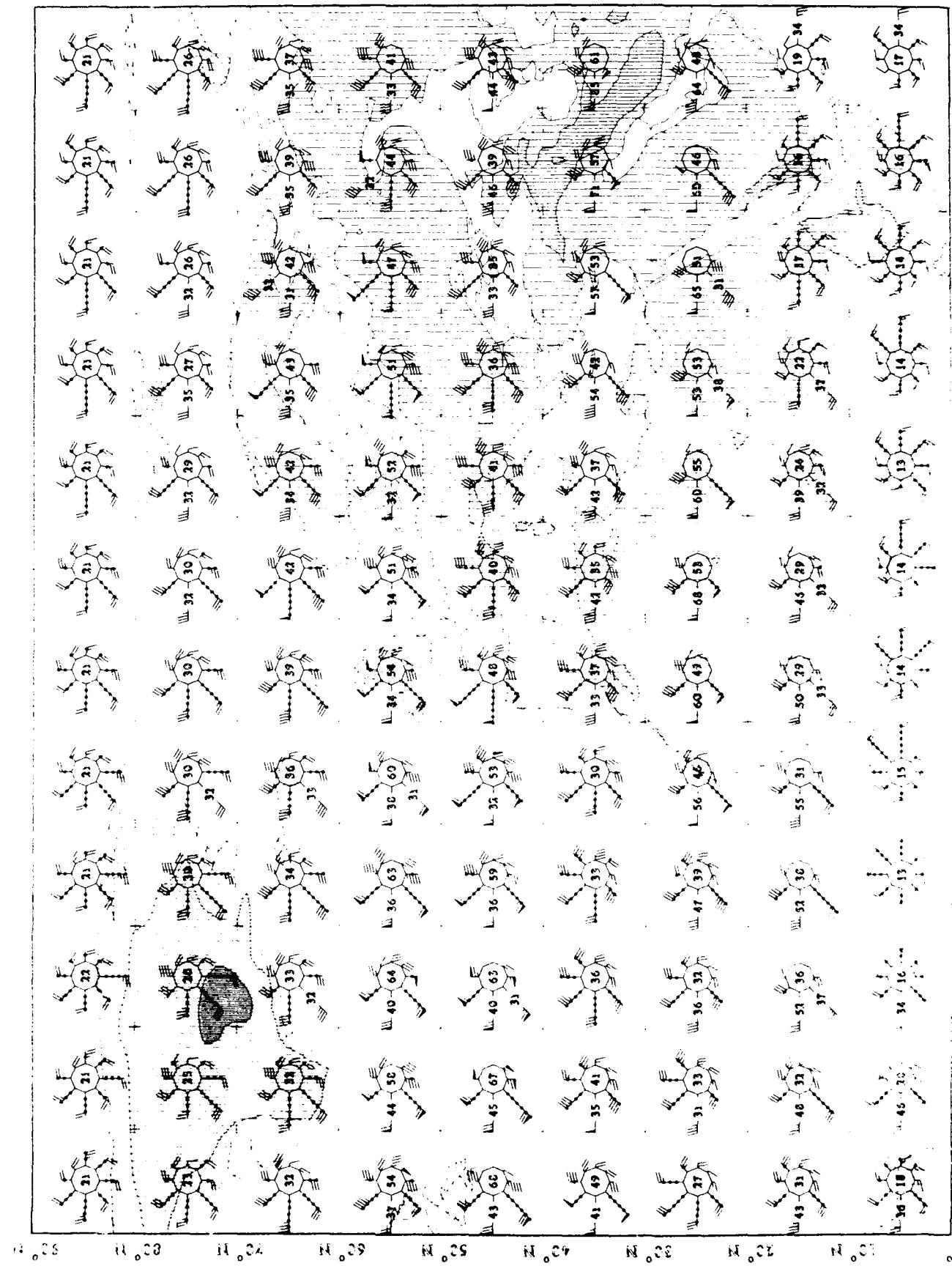
Dipper and Gammie's
Northern Hemisphere

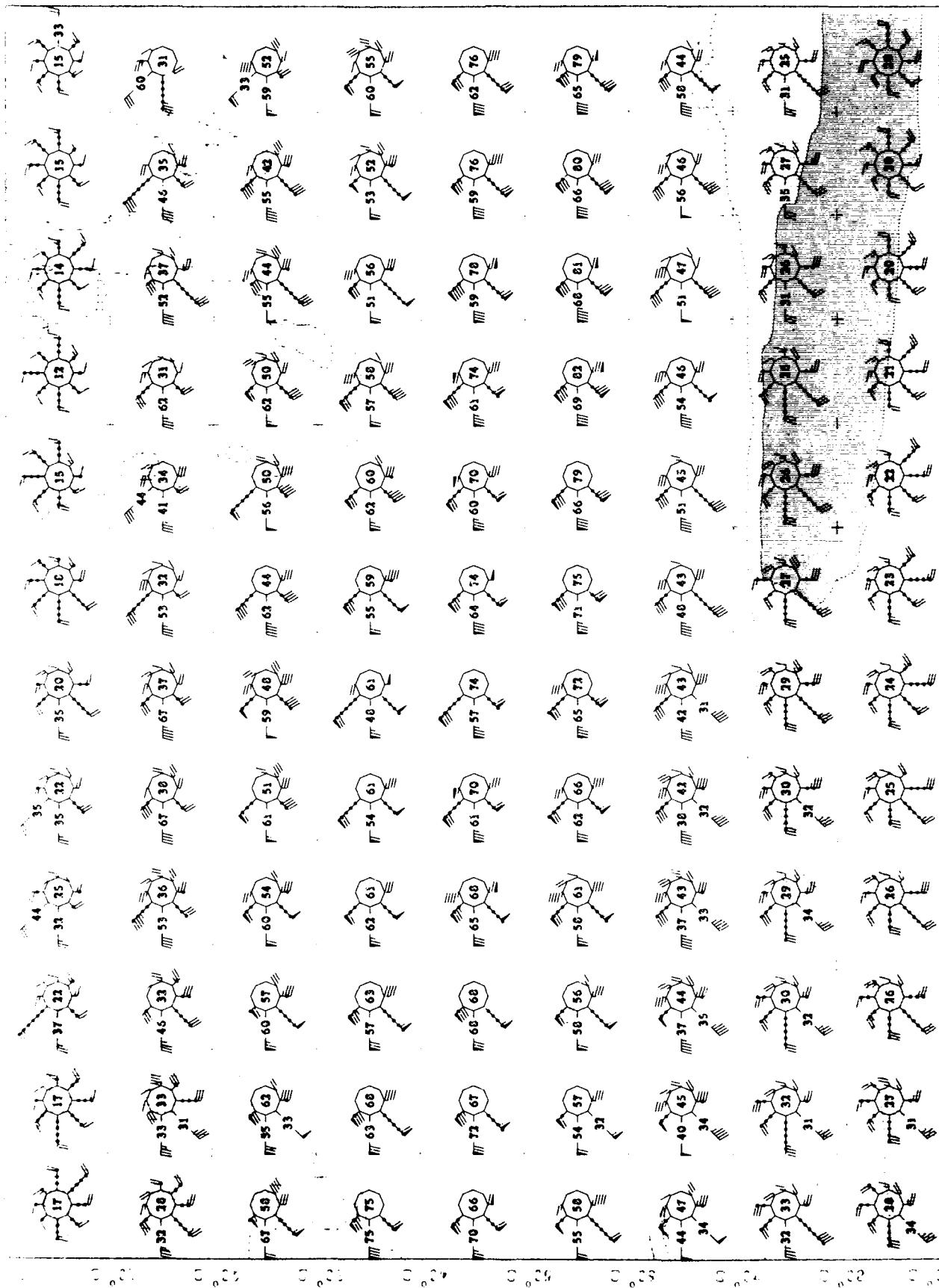




Upper Air Climatology
Northern Hemisphere
Second Decade

Upper Air Climatology
Northern Hemisphere

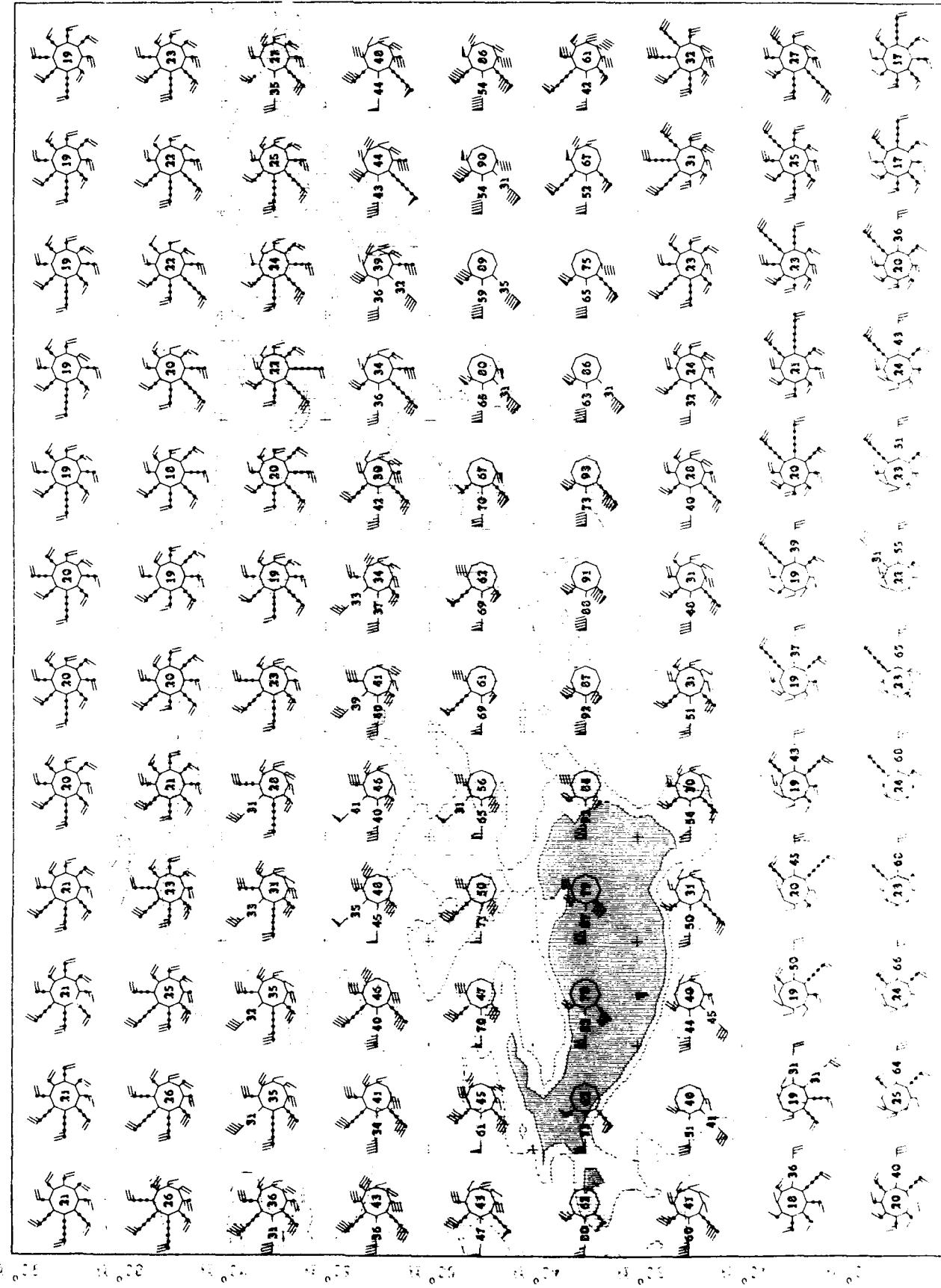


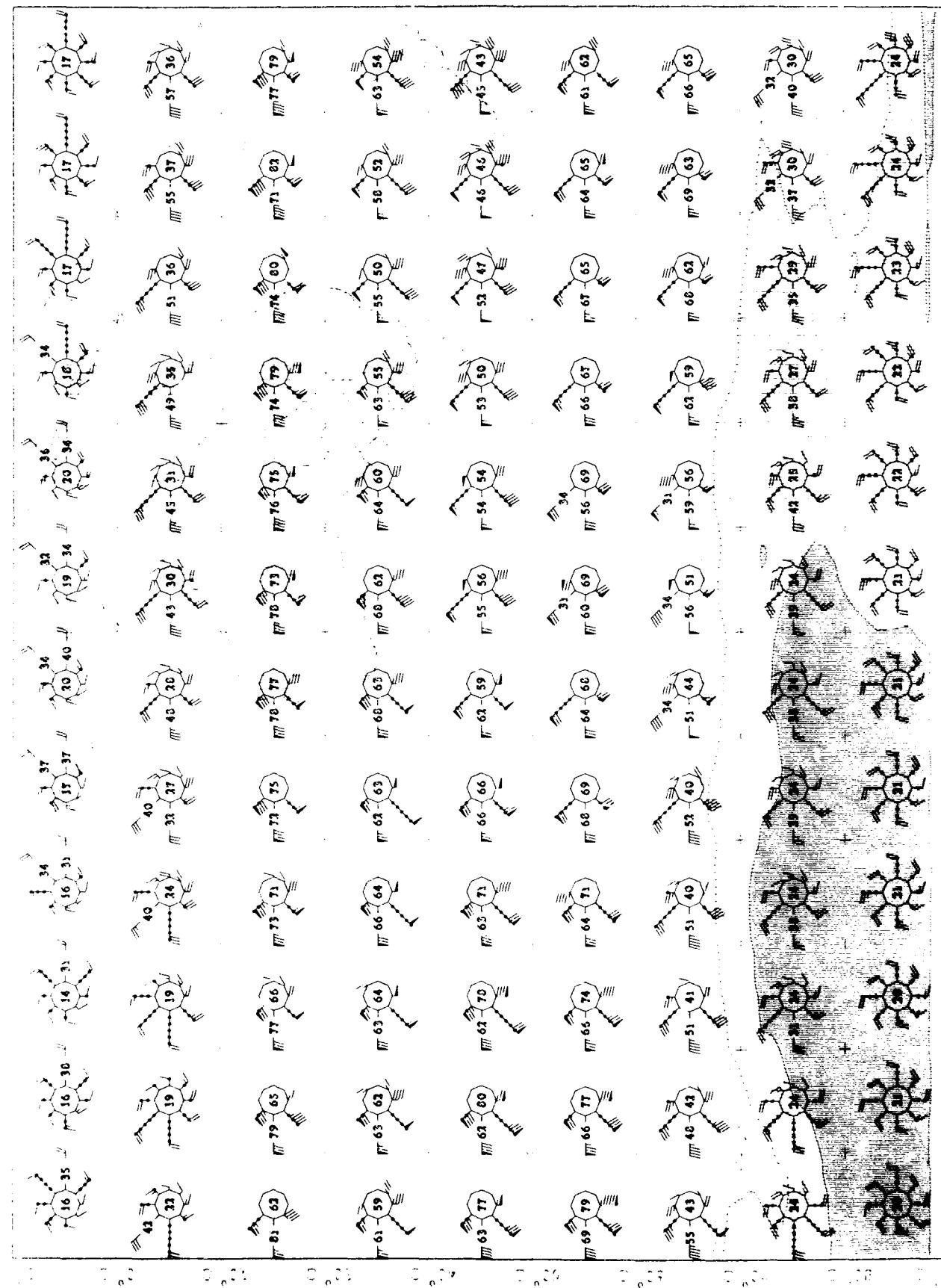


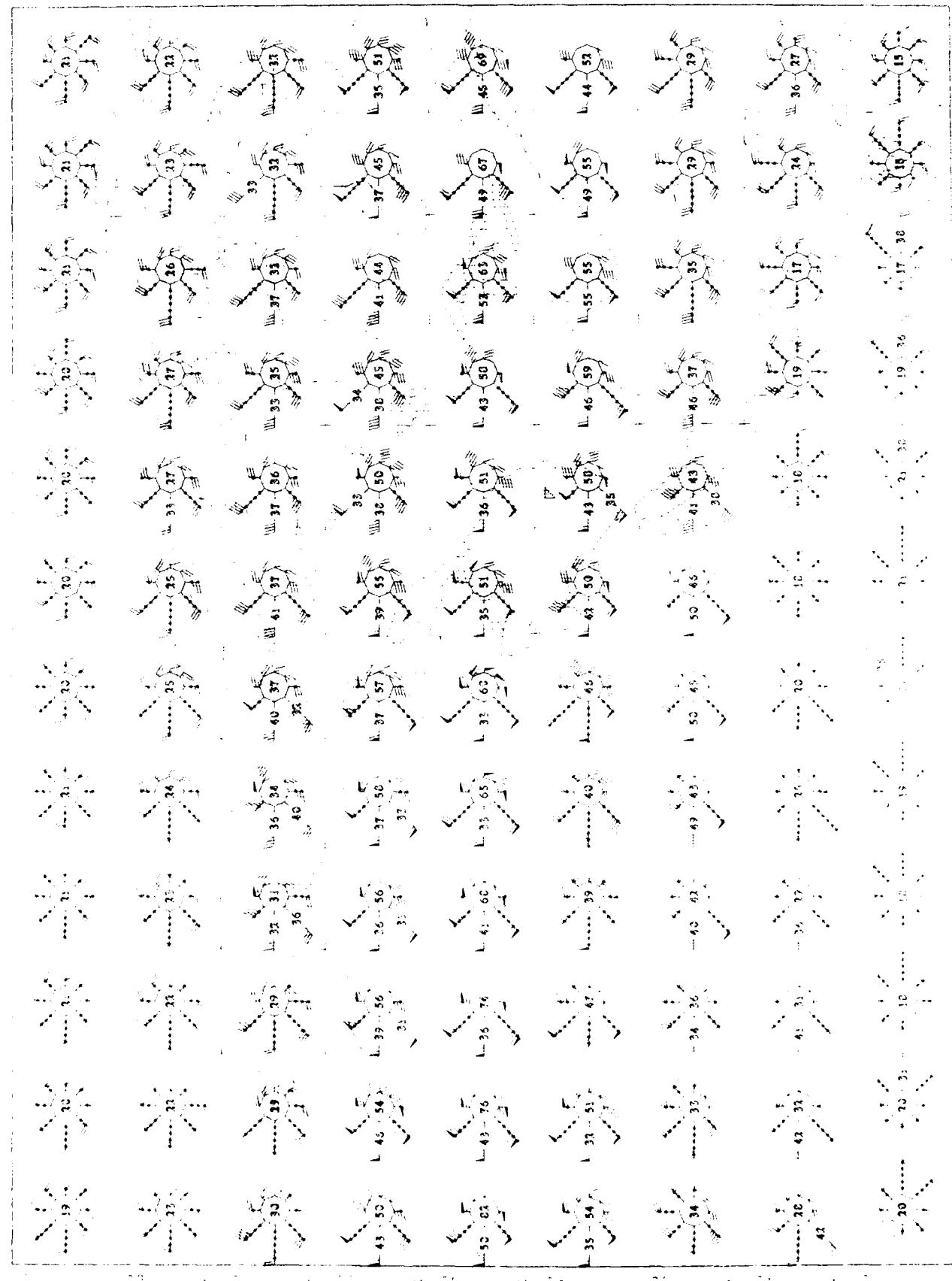
October
200 Mb

50E TO 180E
Wind Rosettes

Upper Air Climatology
Northern Hemisphere







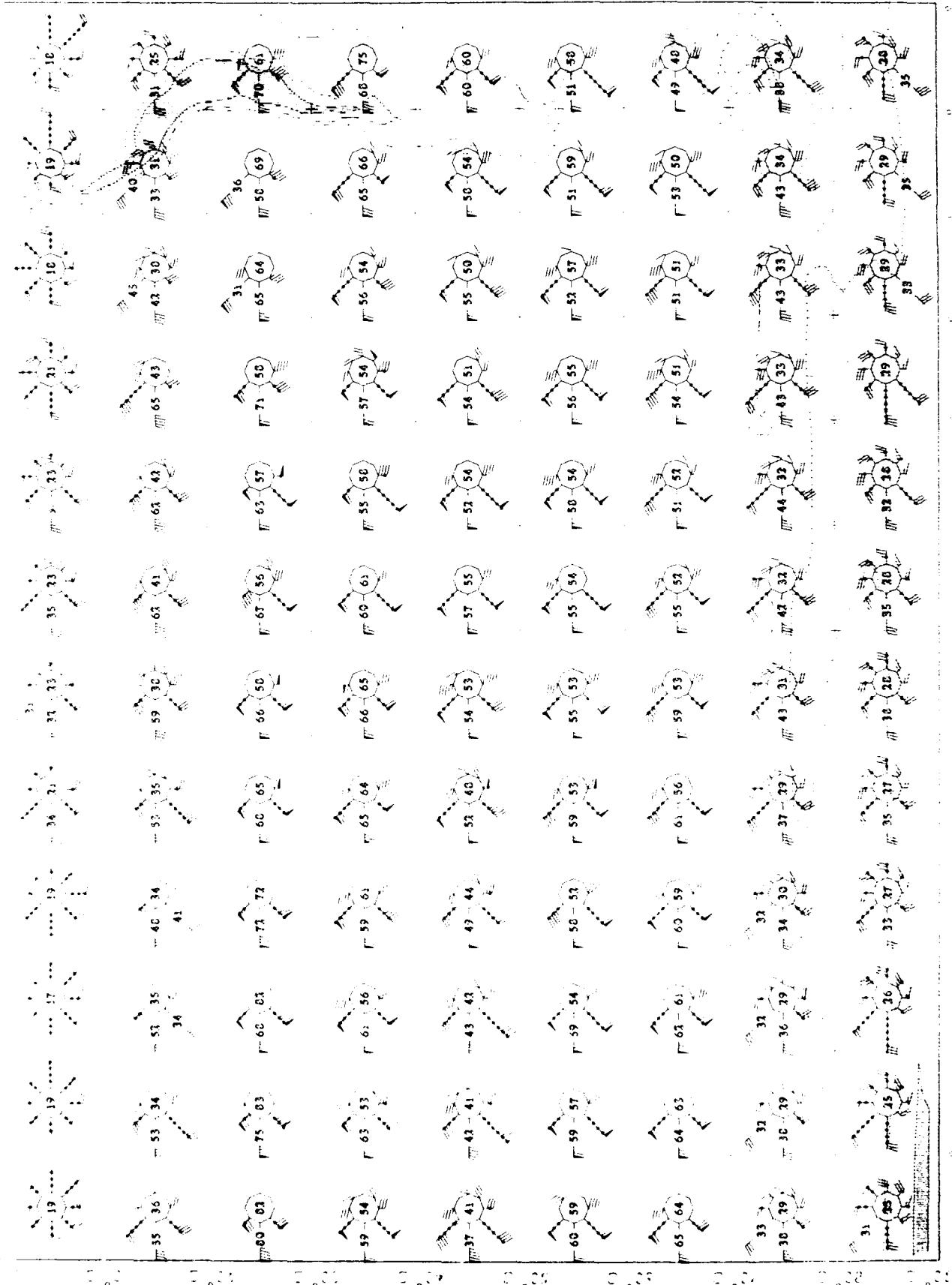
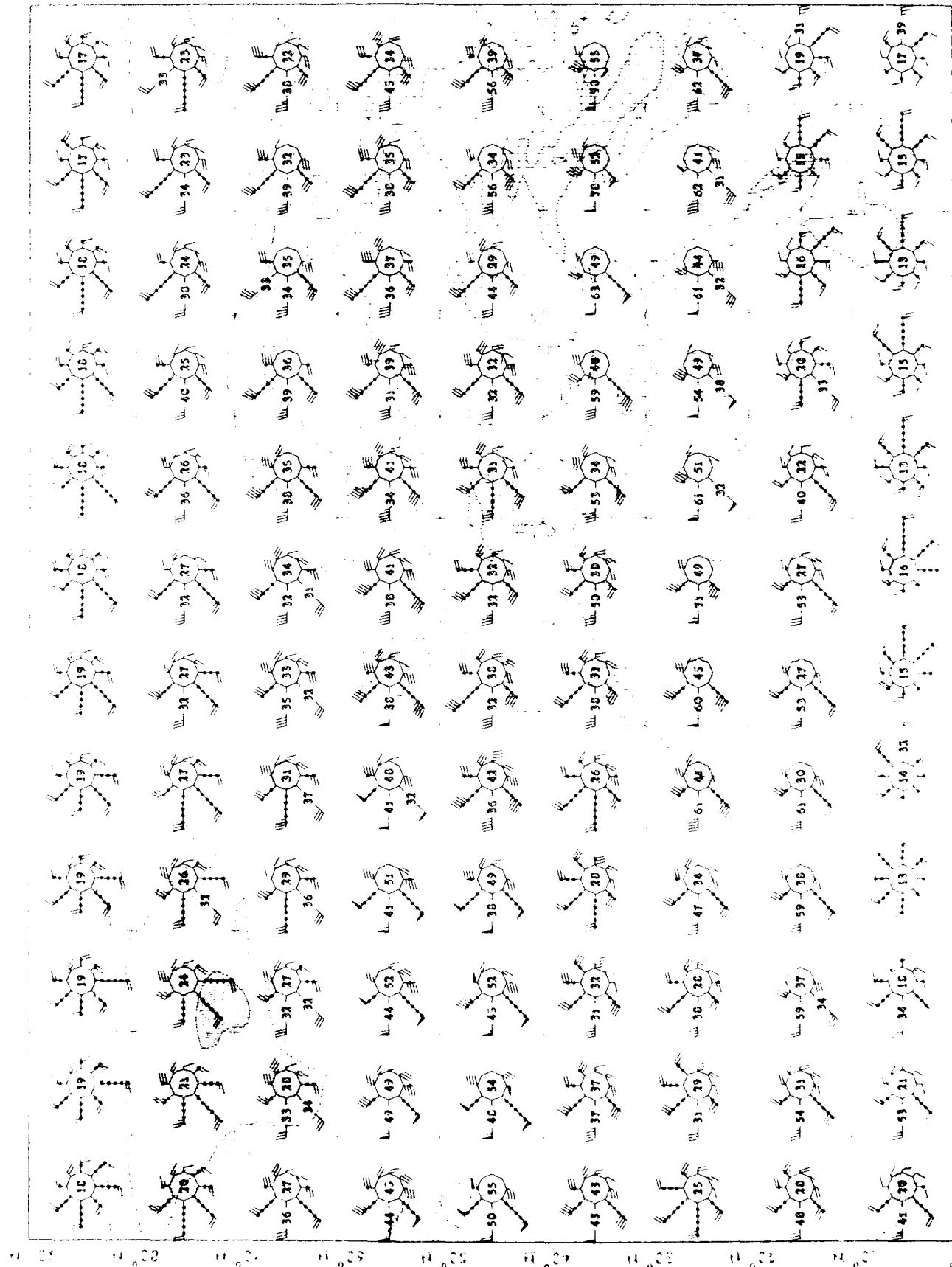
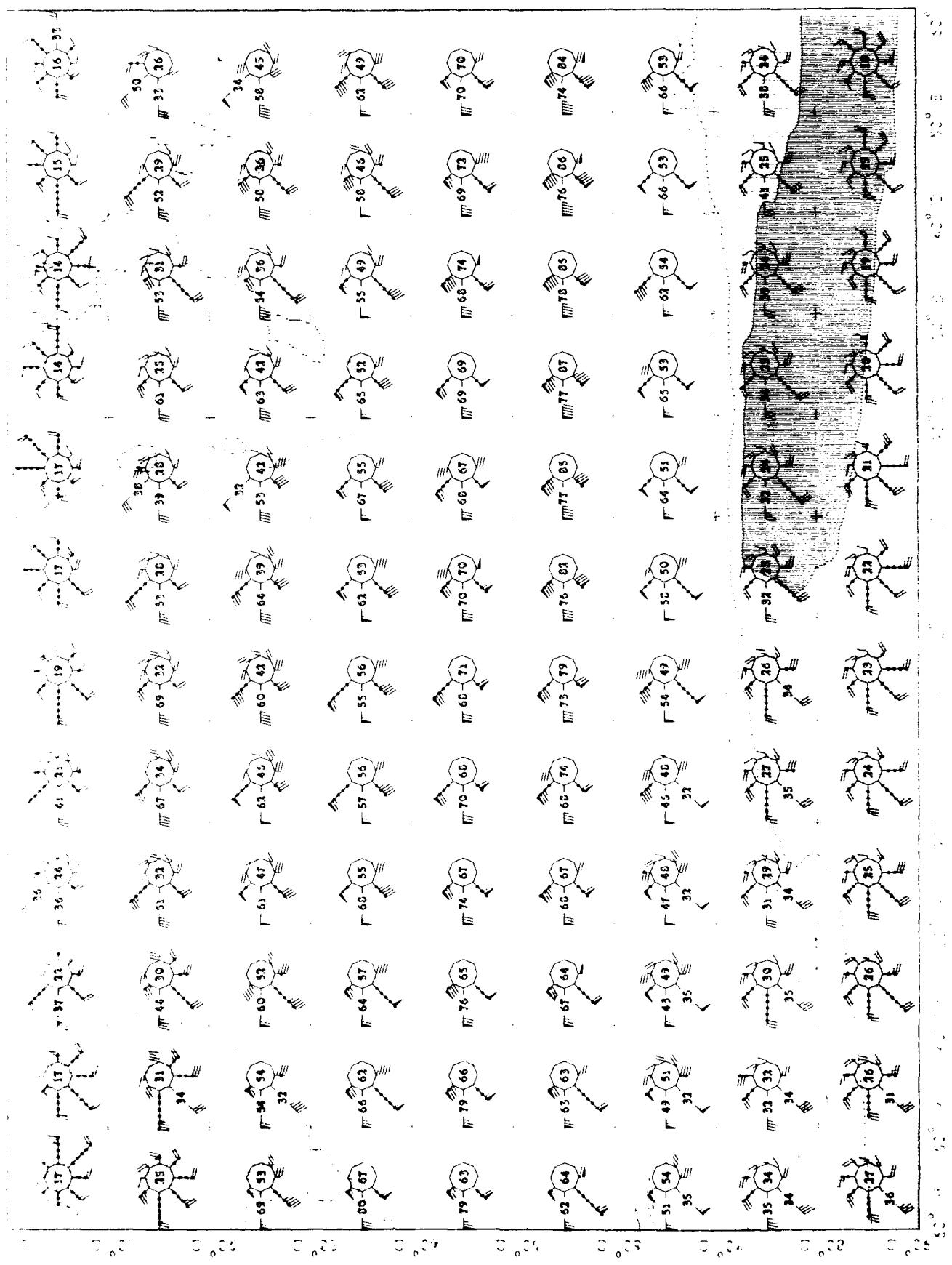


Fig. 2. A map of the Hemicircle
of Australia, showing the
positions of the 55 stations.





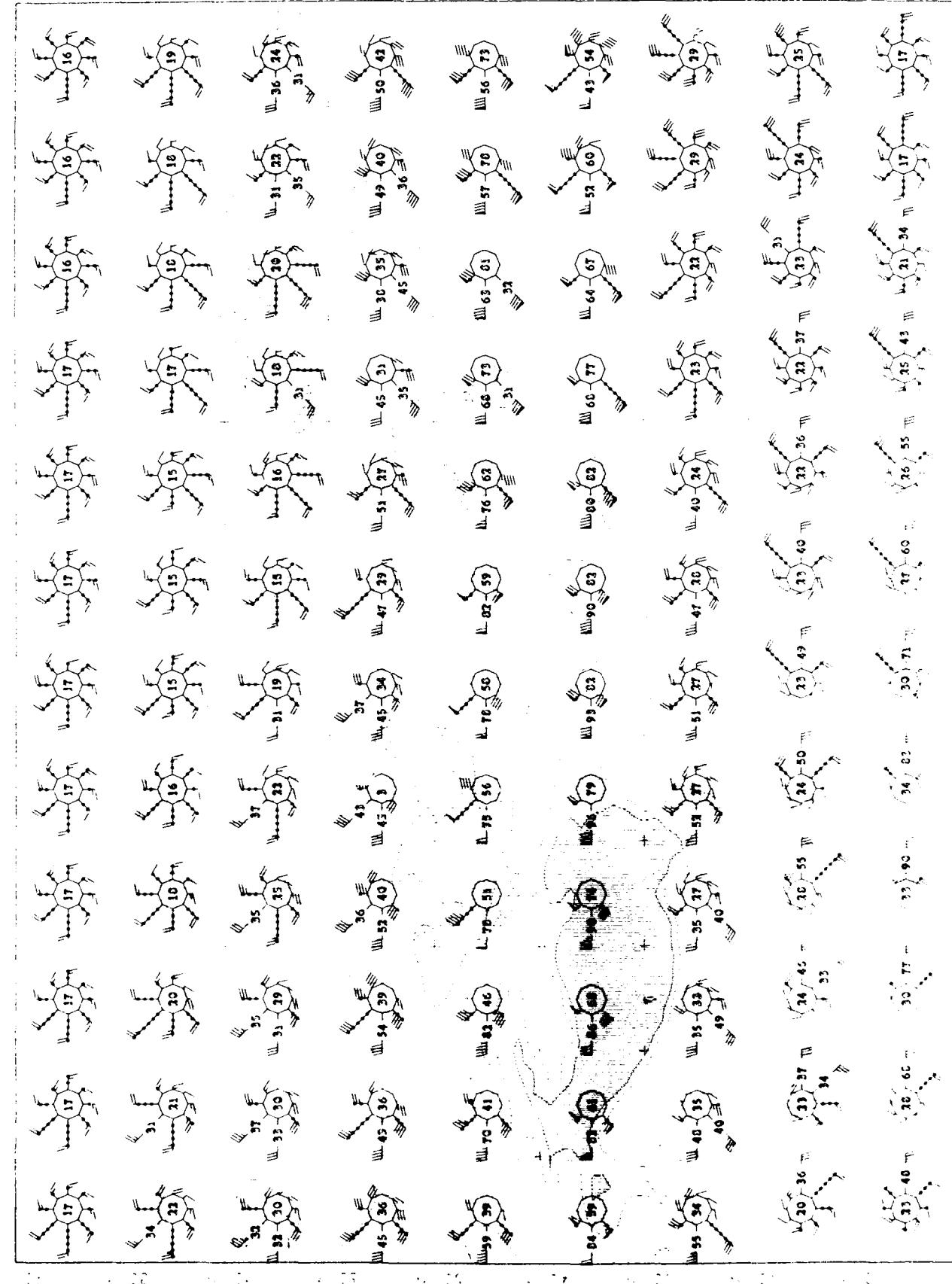
October
150 Mb

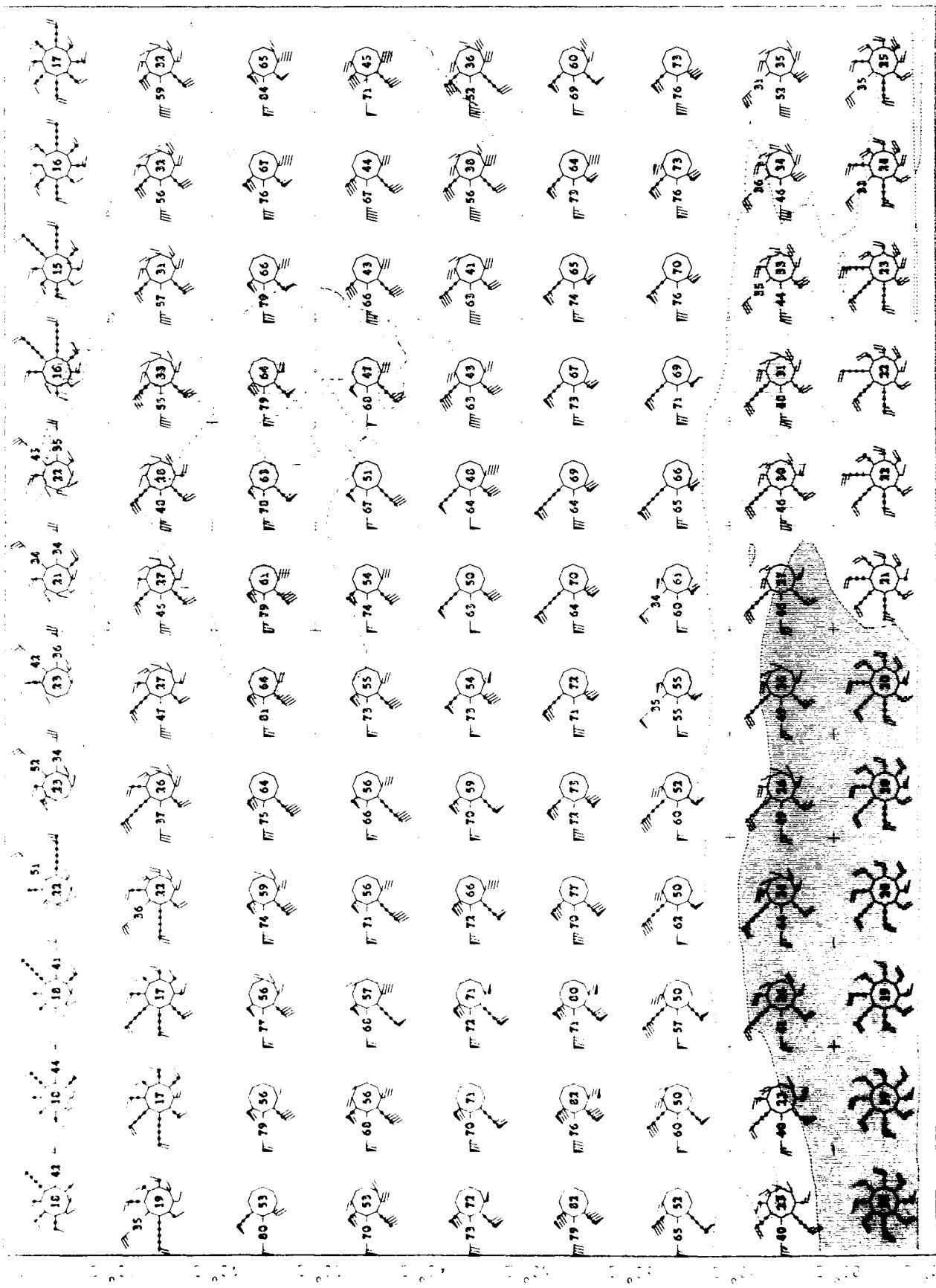
Upper Air Climatology
Southern Hemisphere

Series 2
150 M.

Series 3
Wind Rose

Upper Air Climatology
Northern Hemisphere

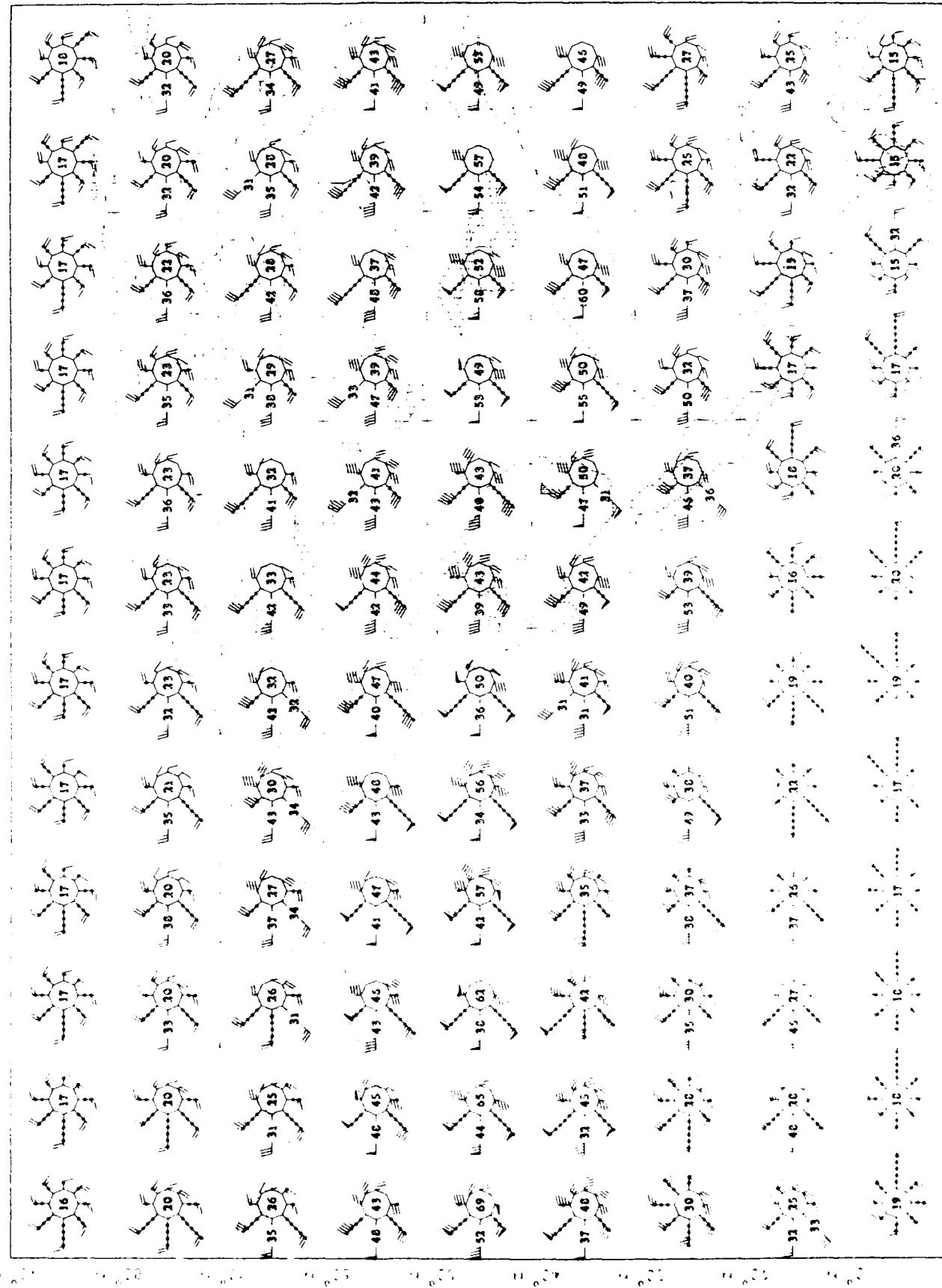


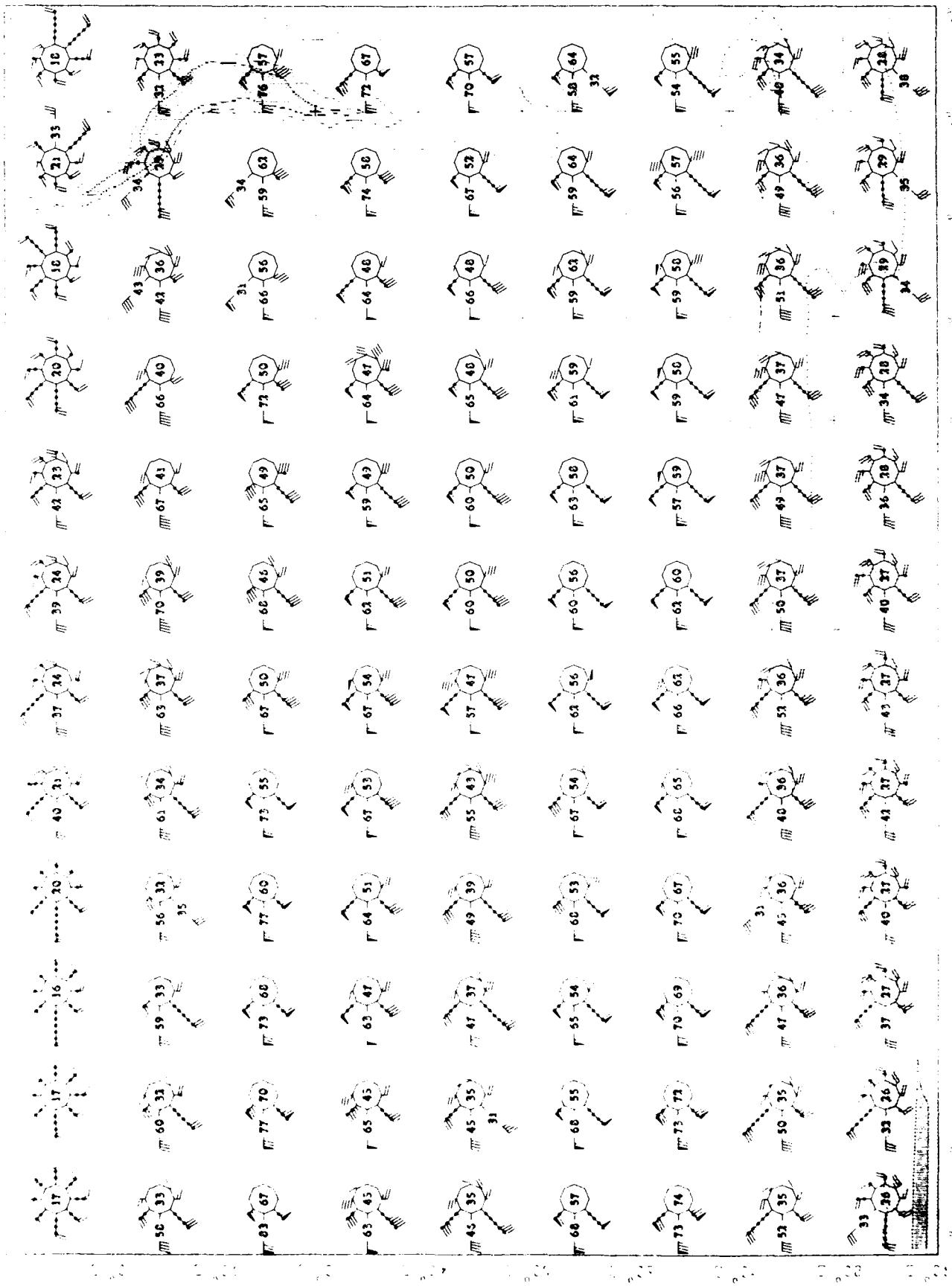


150 M_S

Cloud Cover
Wind Forces

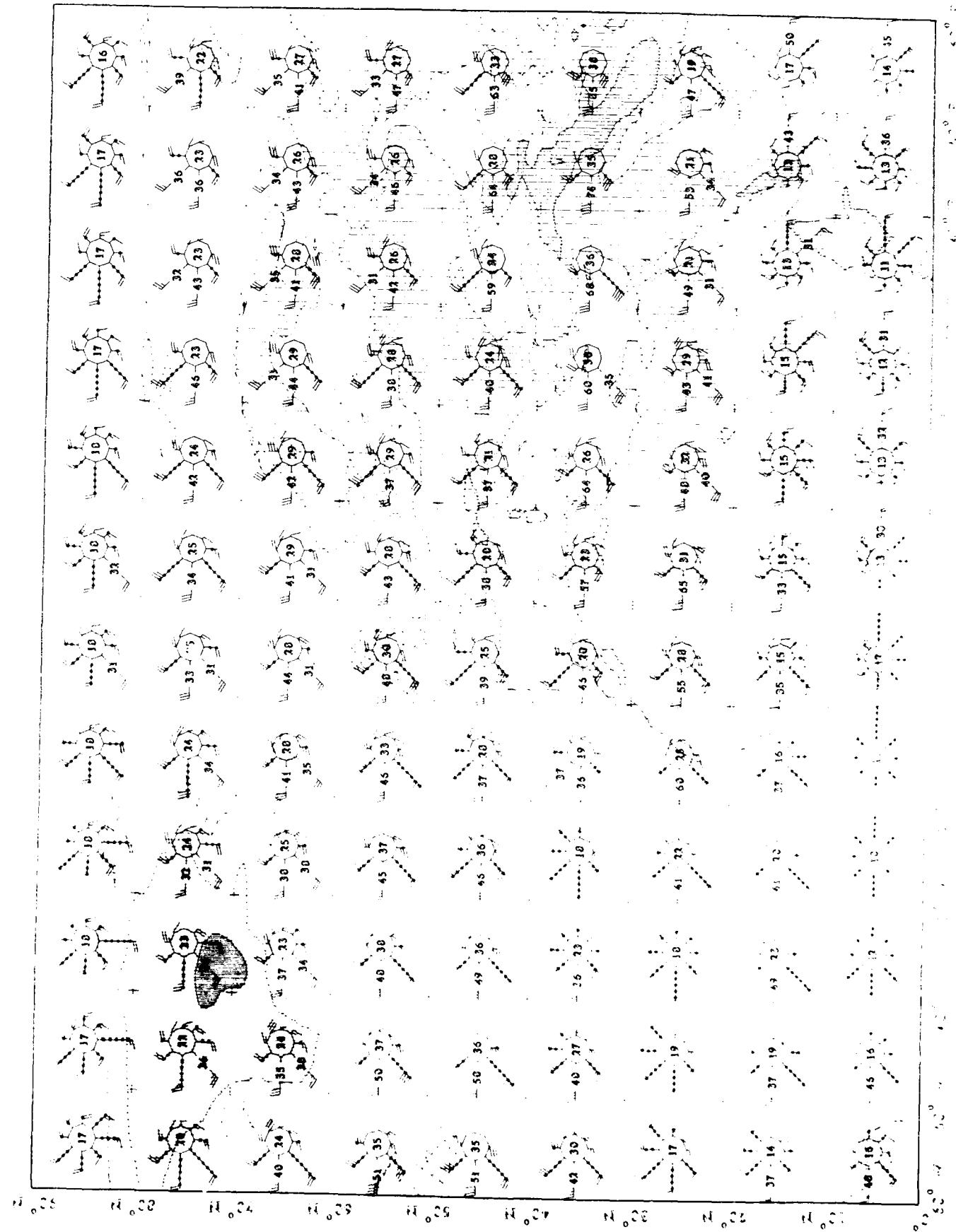
Upper Air Circumference
Northern Hemisphere

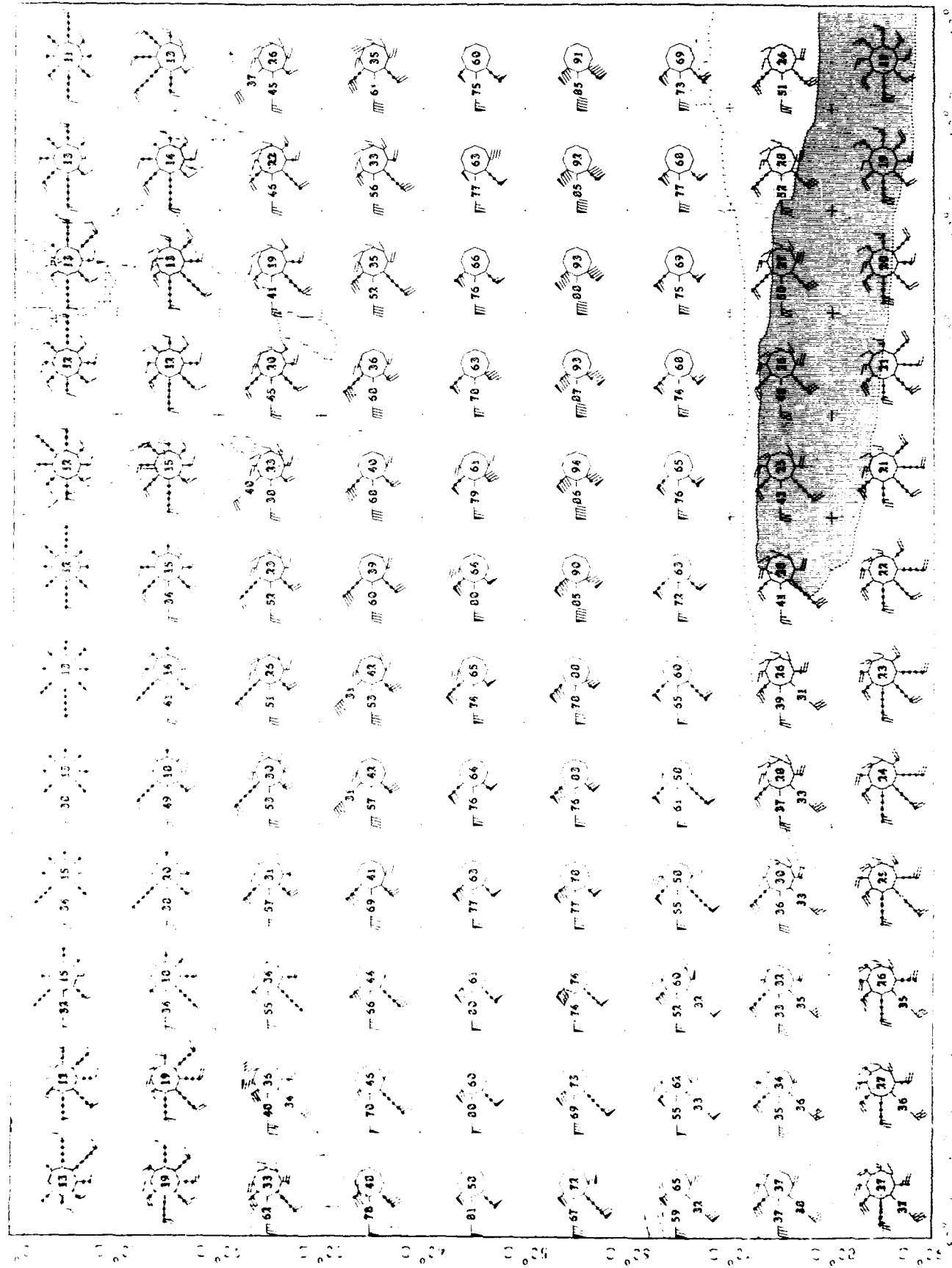




Upper Air
Temperature
Northern Hemisphere

Upper Air
Temperature
Northern Hemisphere

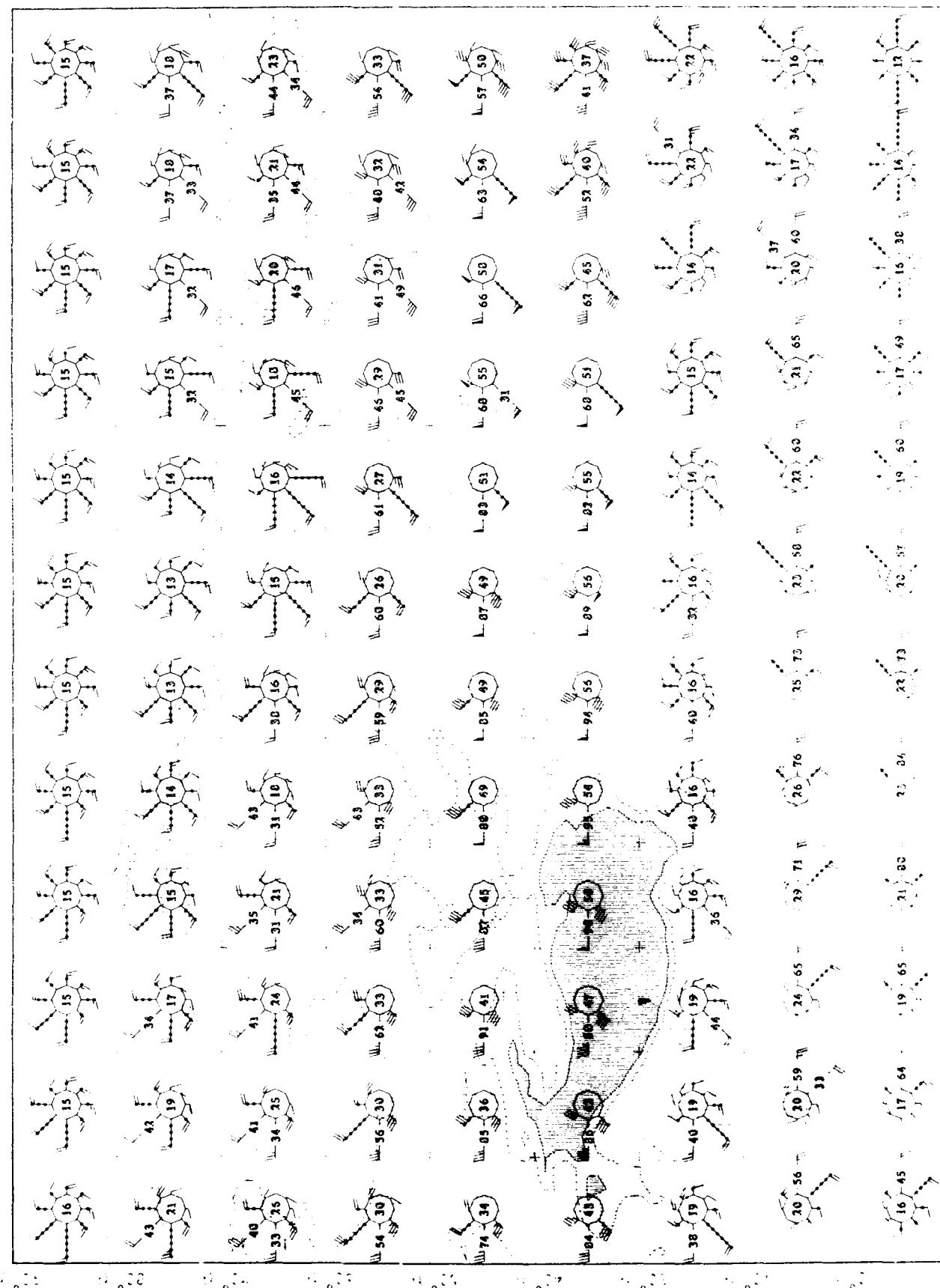


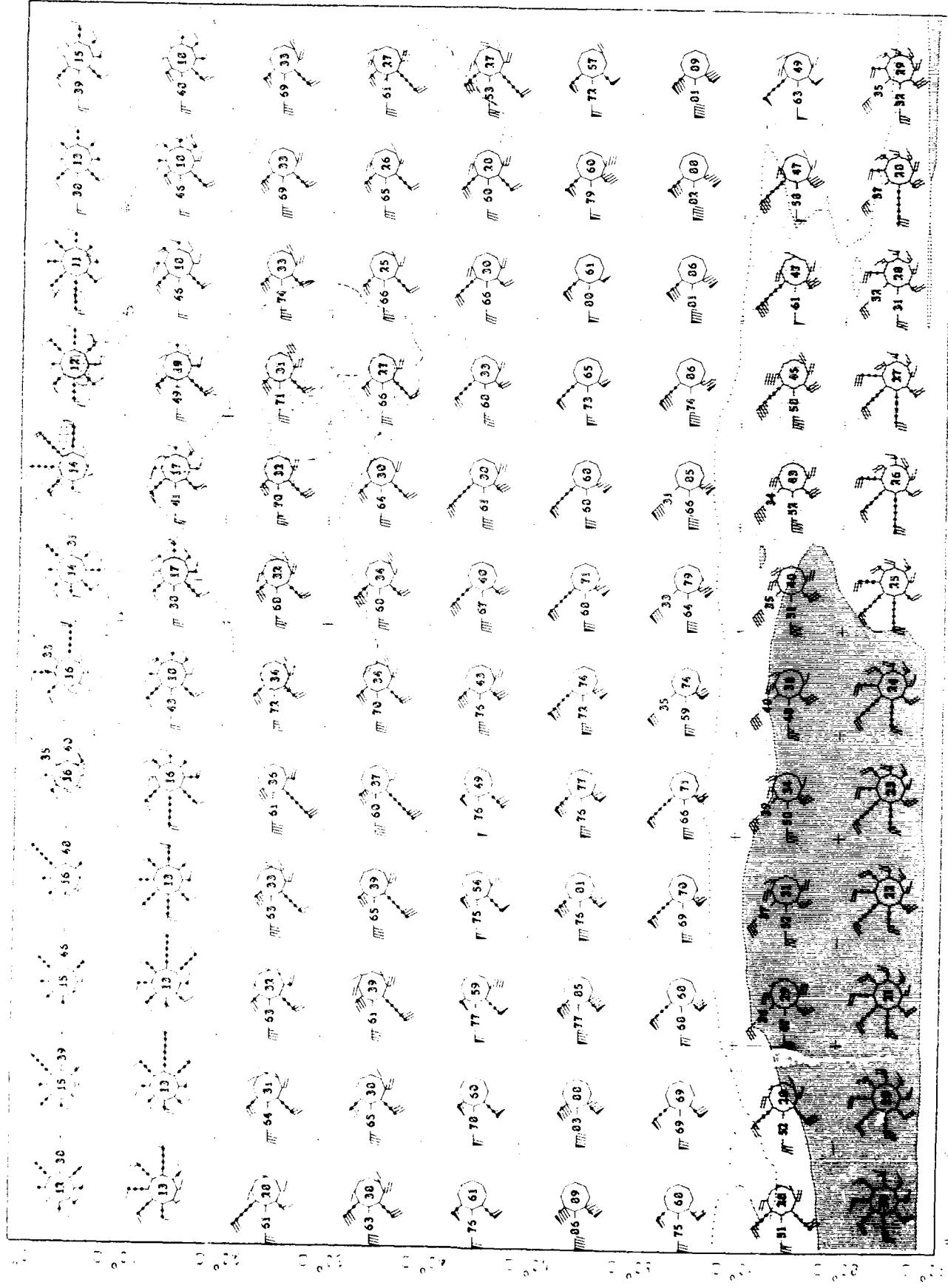


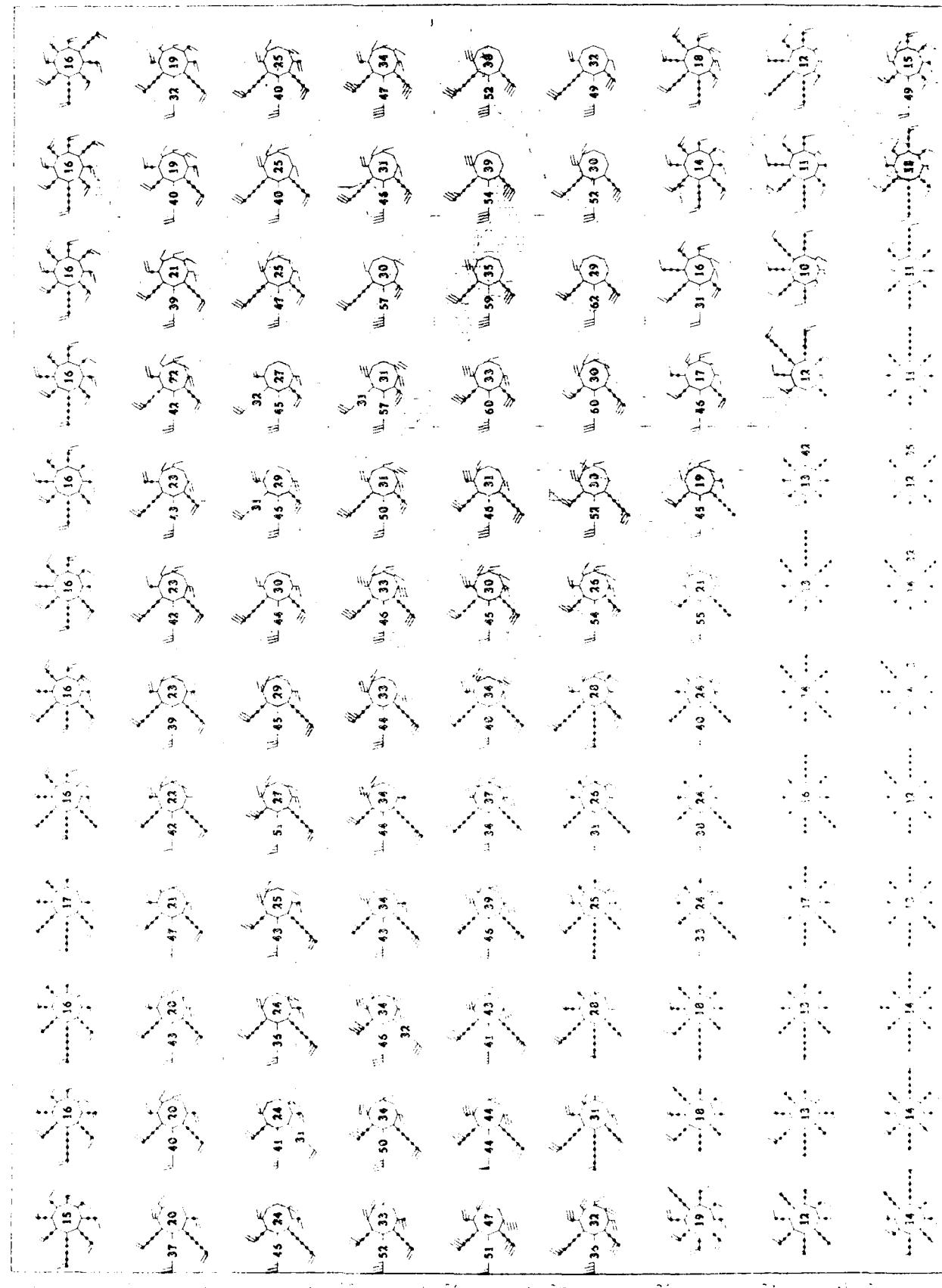
100 m.s.
100 m.s.

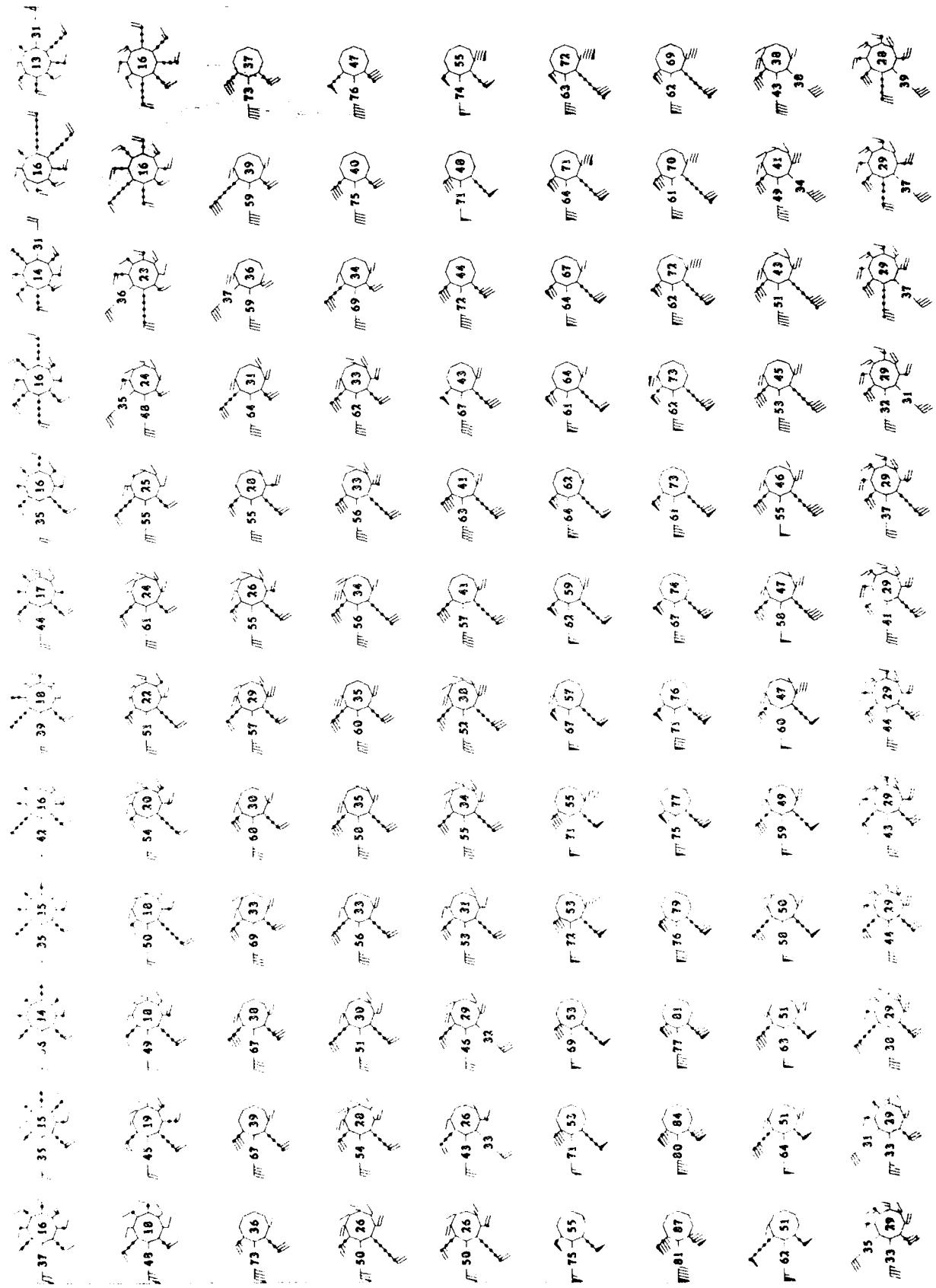
500 m.s.
500 m.s.

Hypoxanthine Guanine
Nucleotide Metabolism





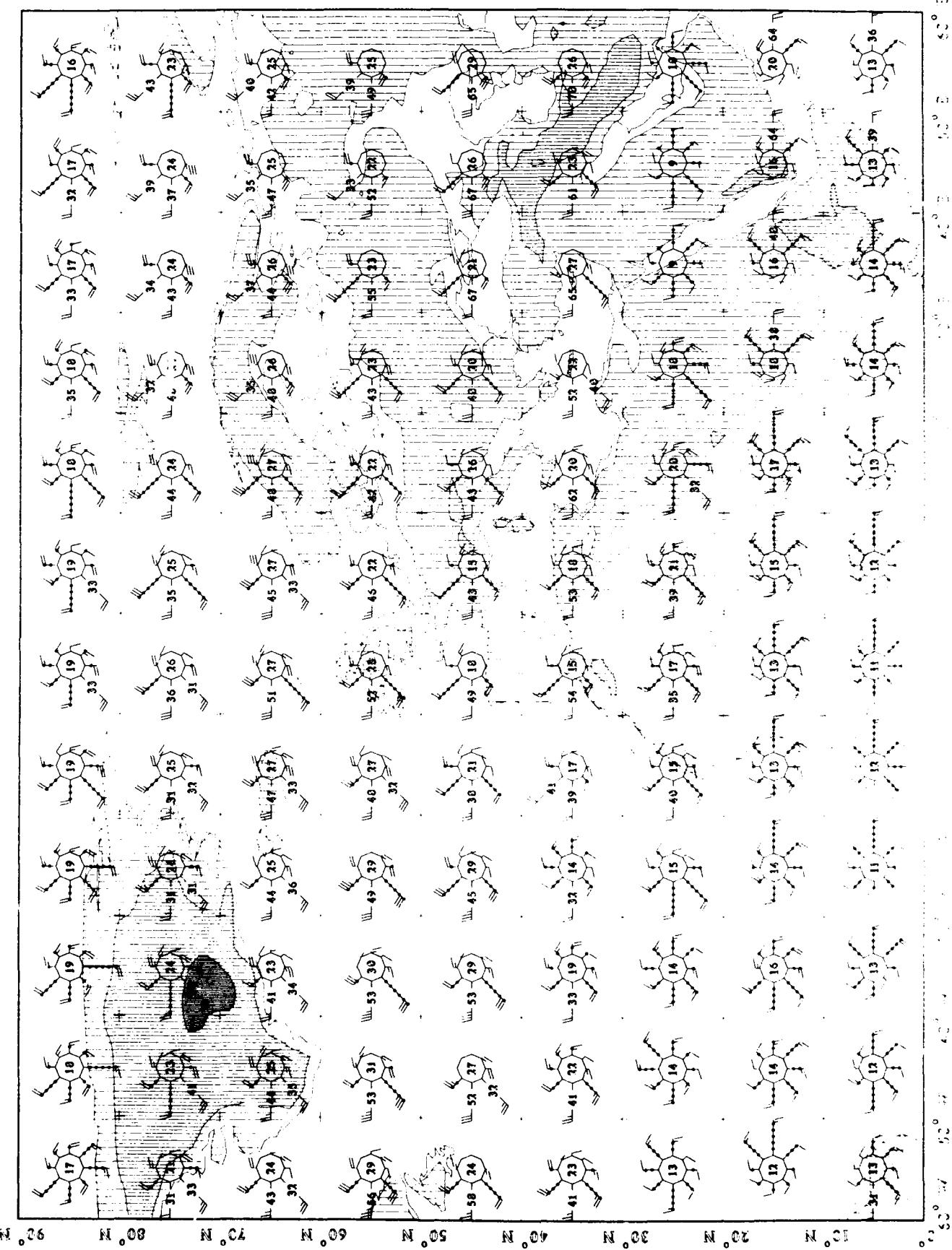




OCTOBER
70 MILS

SUMMER 1965
WIND ROSES

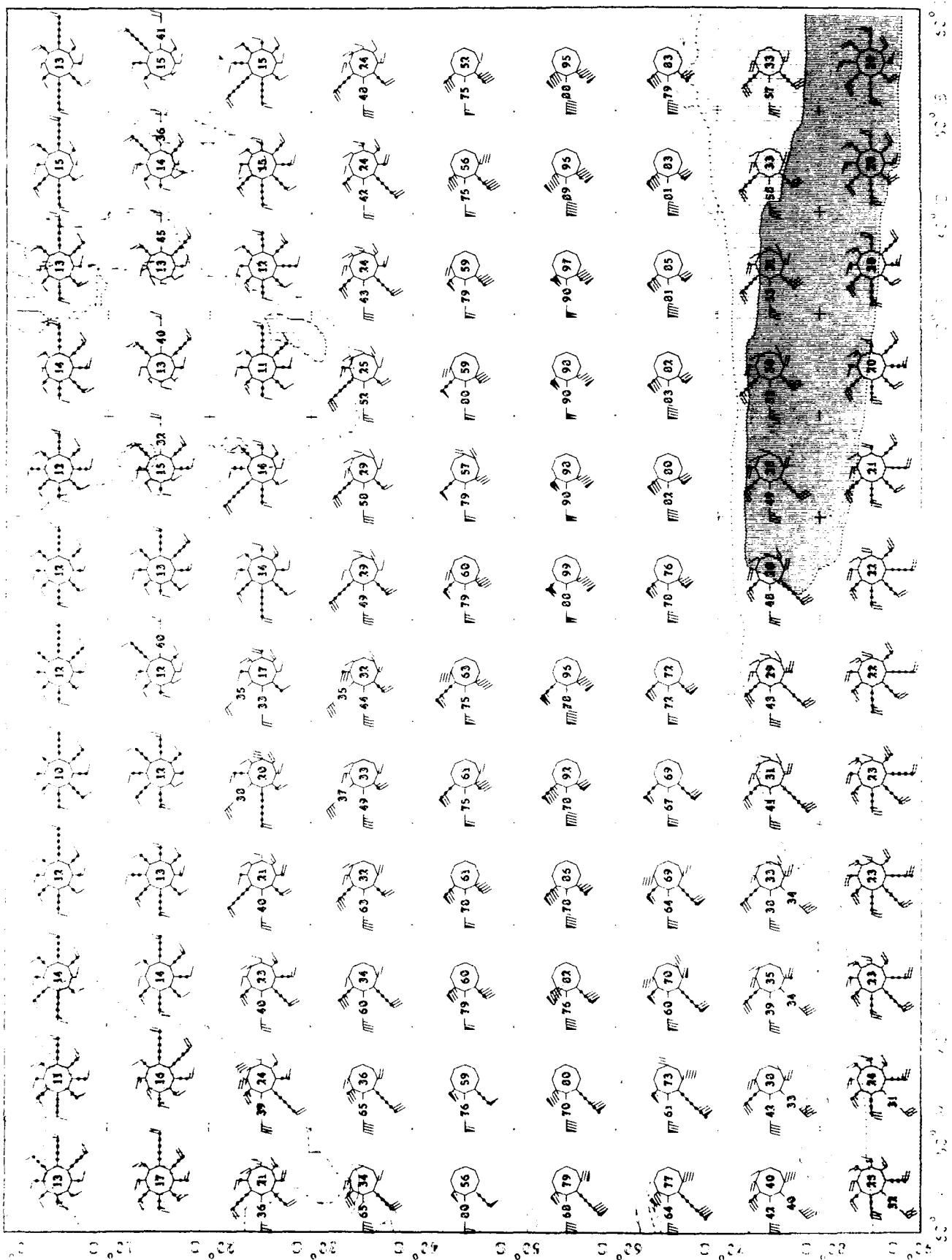
Upper Air Climatology
Northern Hemisphere

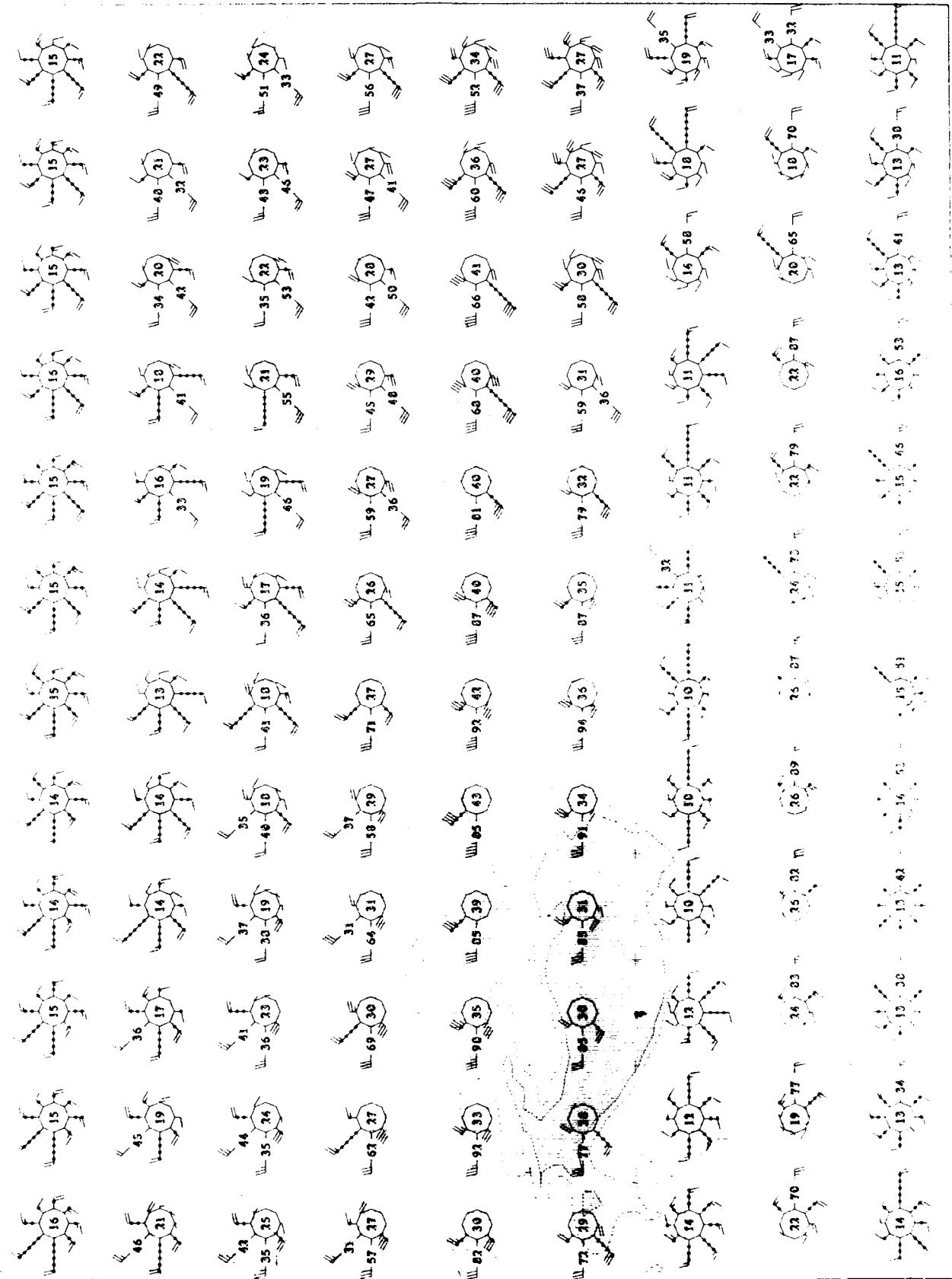


Upper Air Climatology
Southern Hemisphere

Oct 1970

70 mb

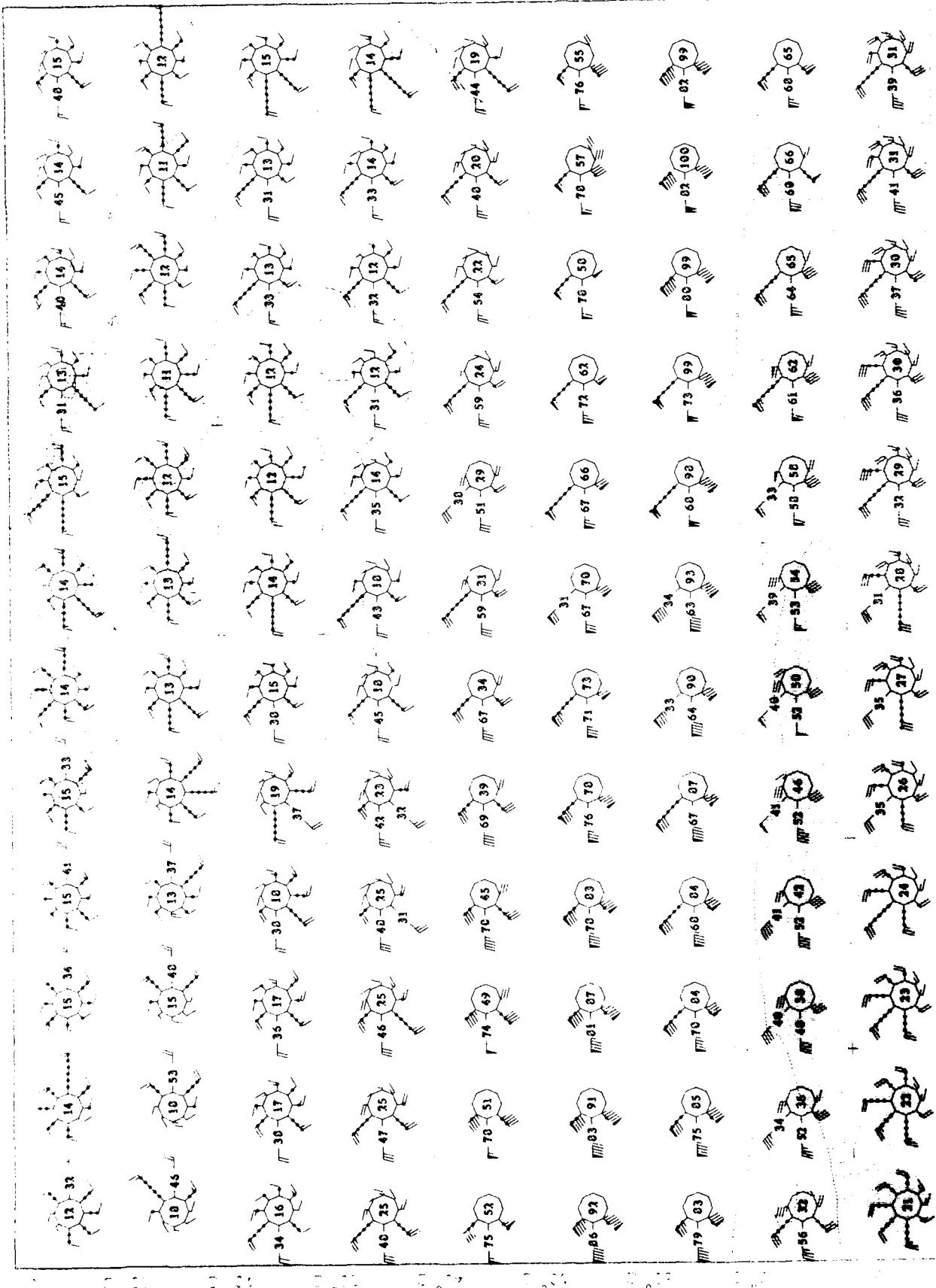




Upper Air Climatology
Southern Hemisphere

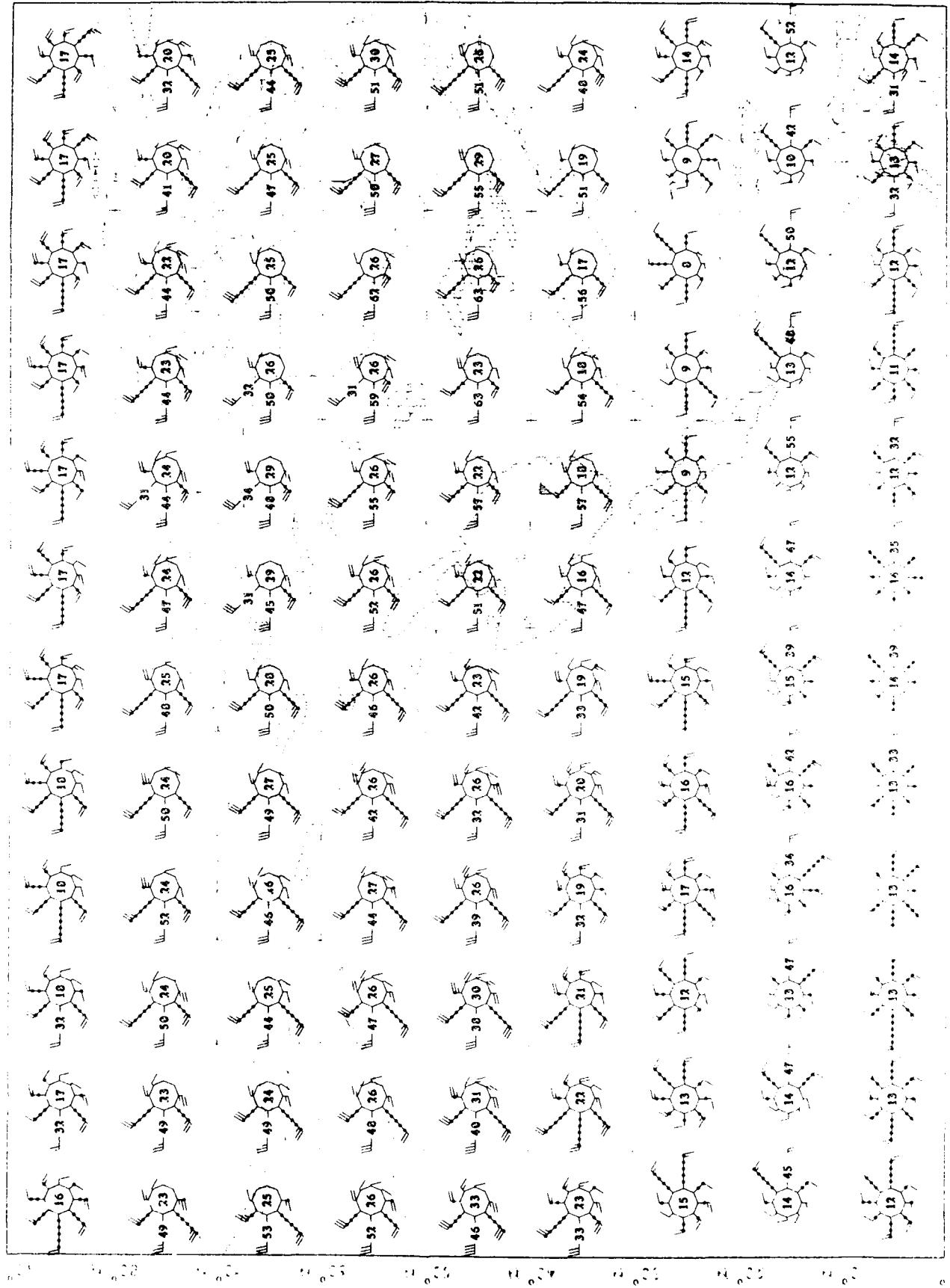
1930-1959
1960-1979
1980-1999

Series 2
70 M²



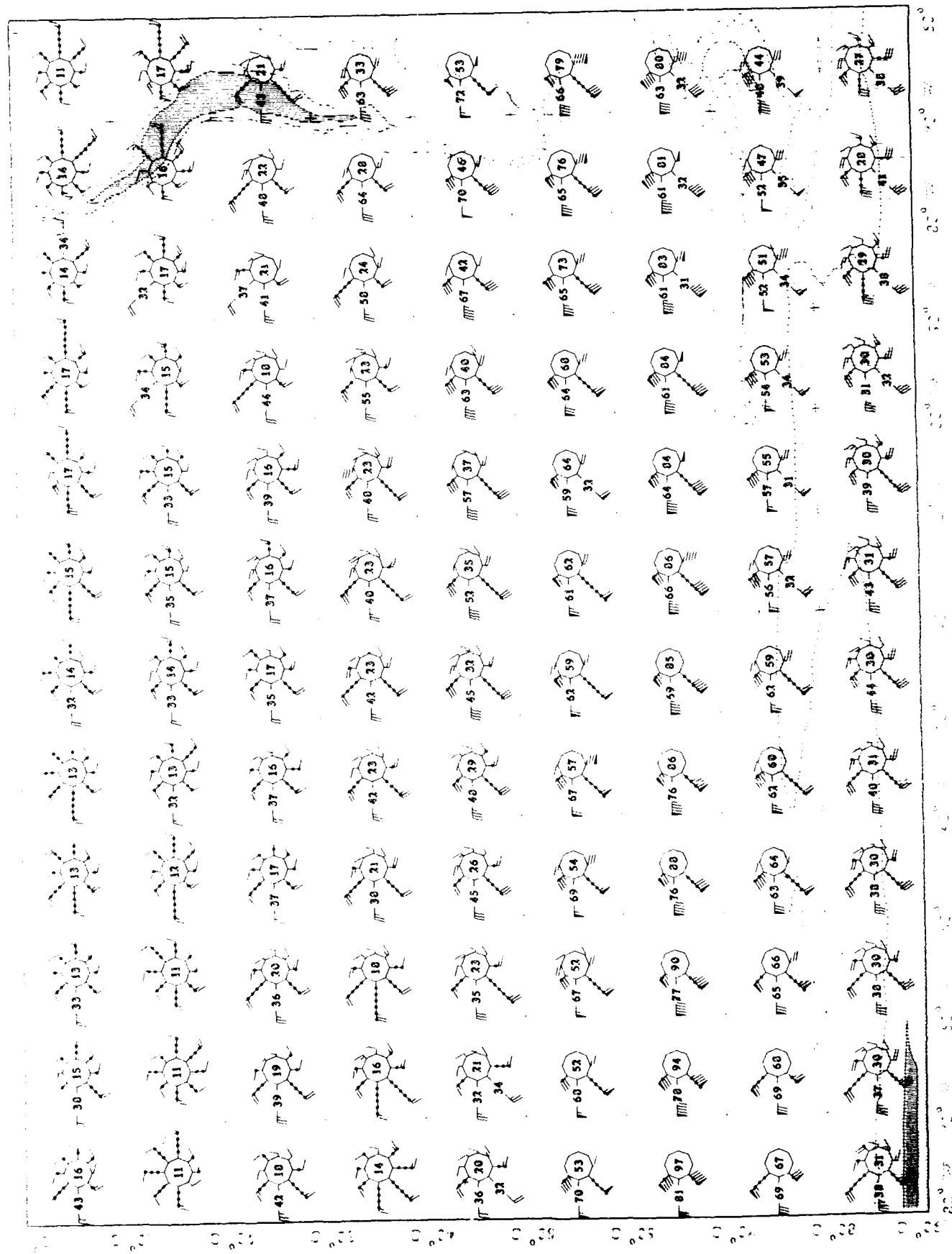
Upper and Middle Layer
Northern Hemisphere

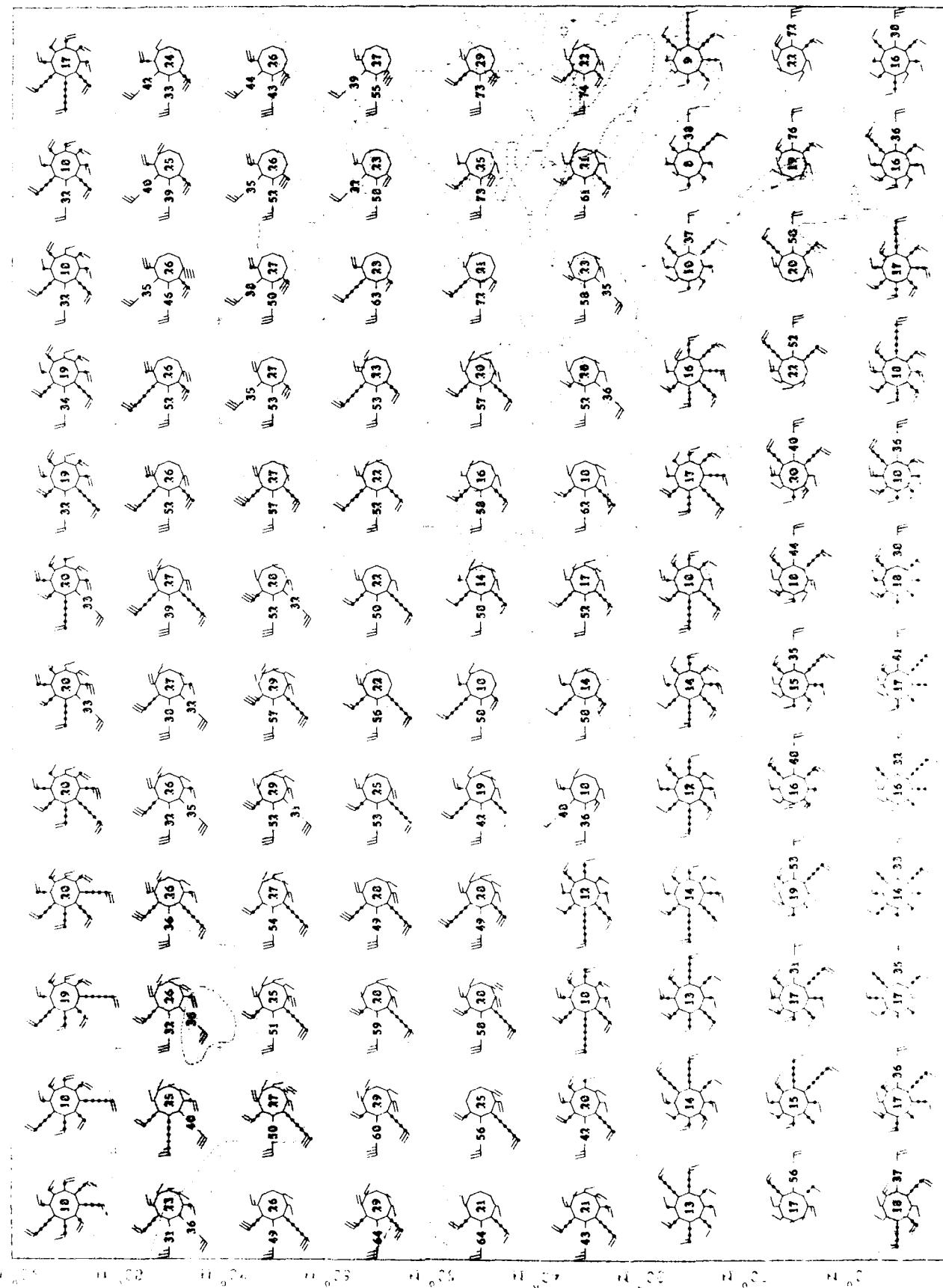
1950-51
Average



Upper Air Climatology
Southern Hemisphere

October 1950
70 Mb

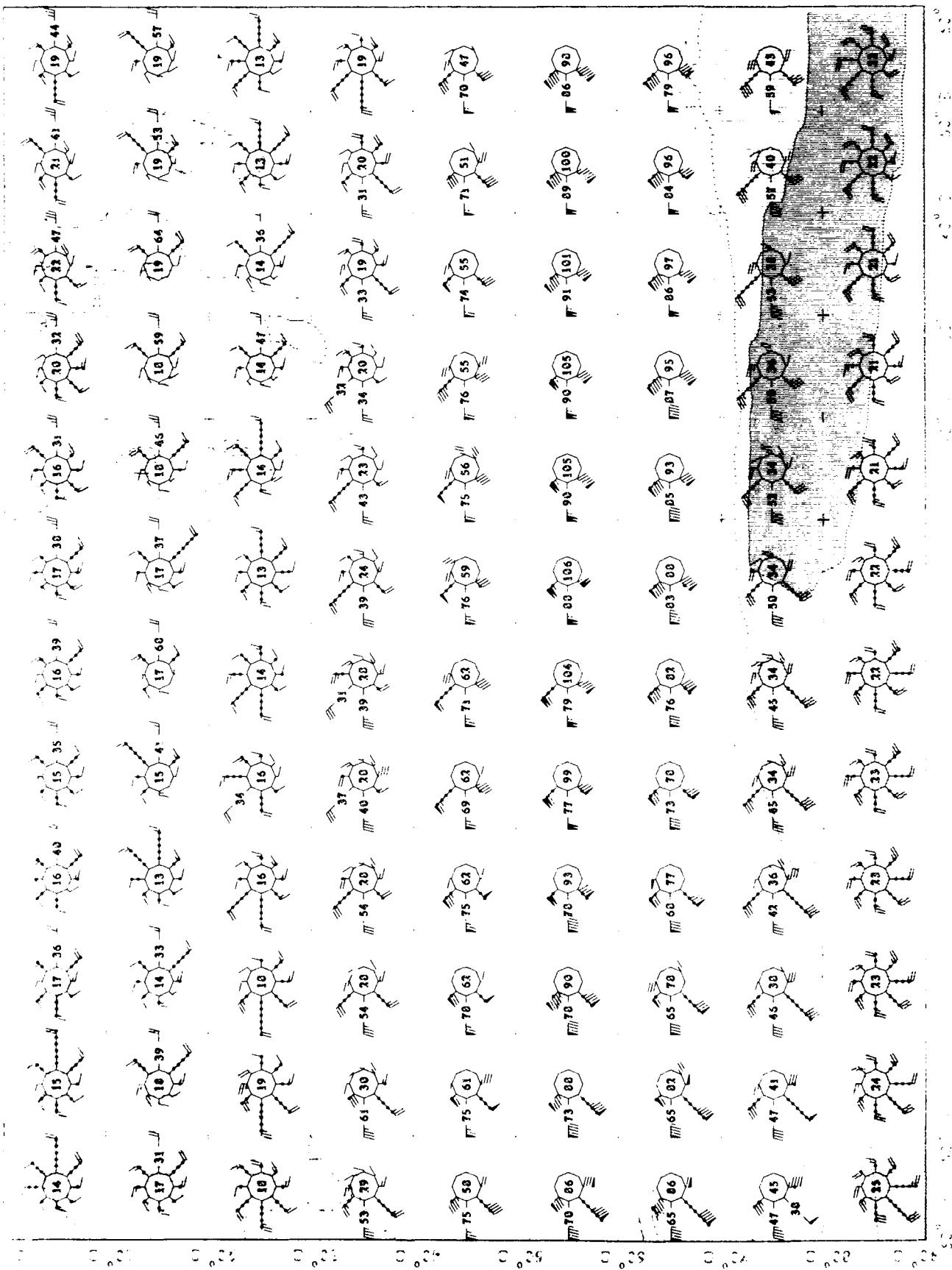


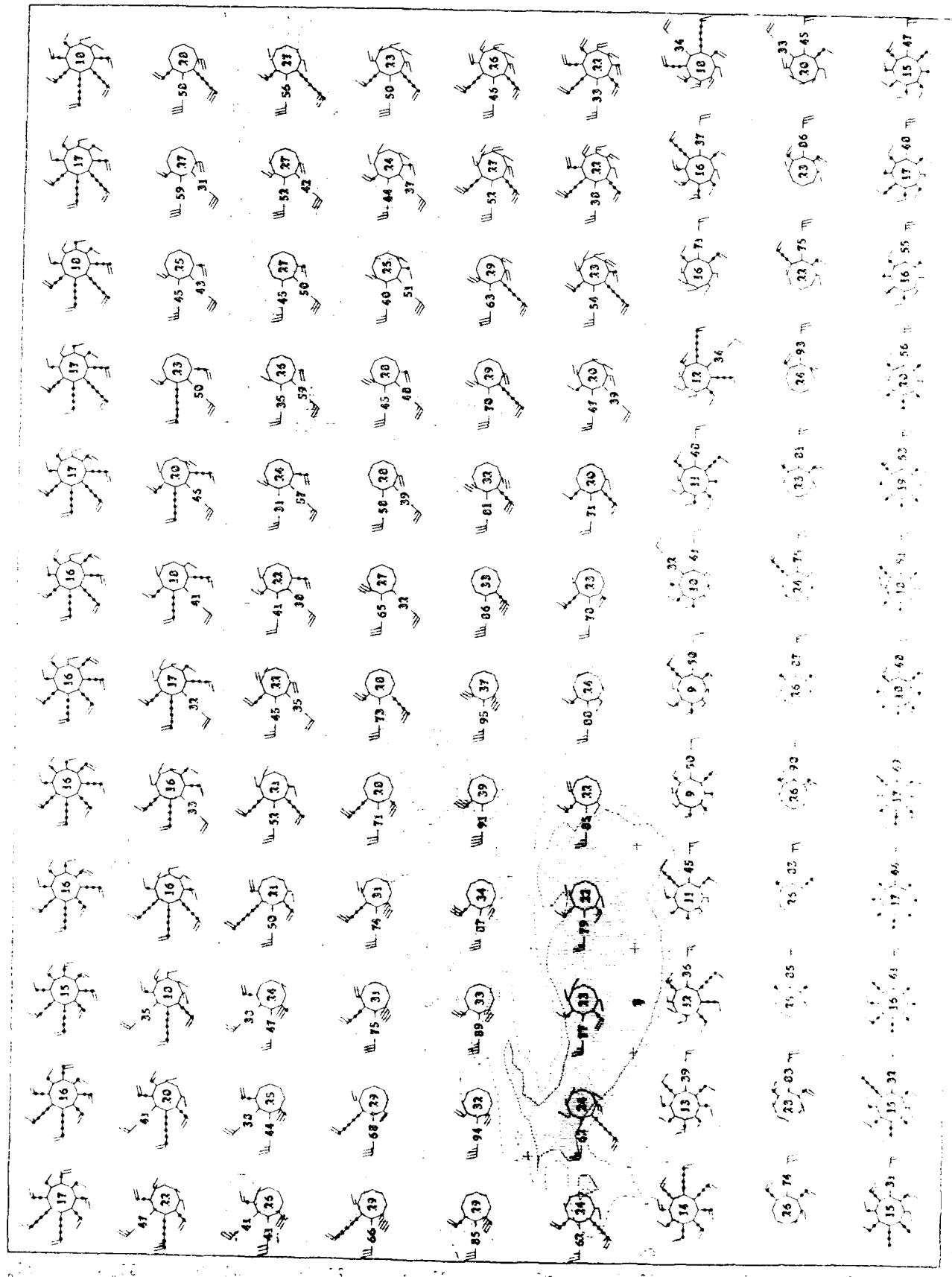


Upper Air Climatology
Southern Hemisphere

500 mb

October
50 mb

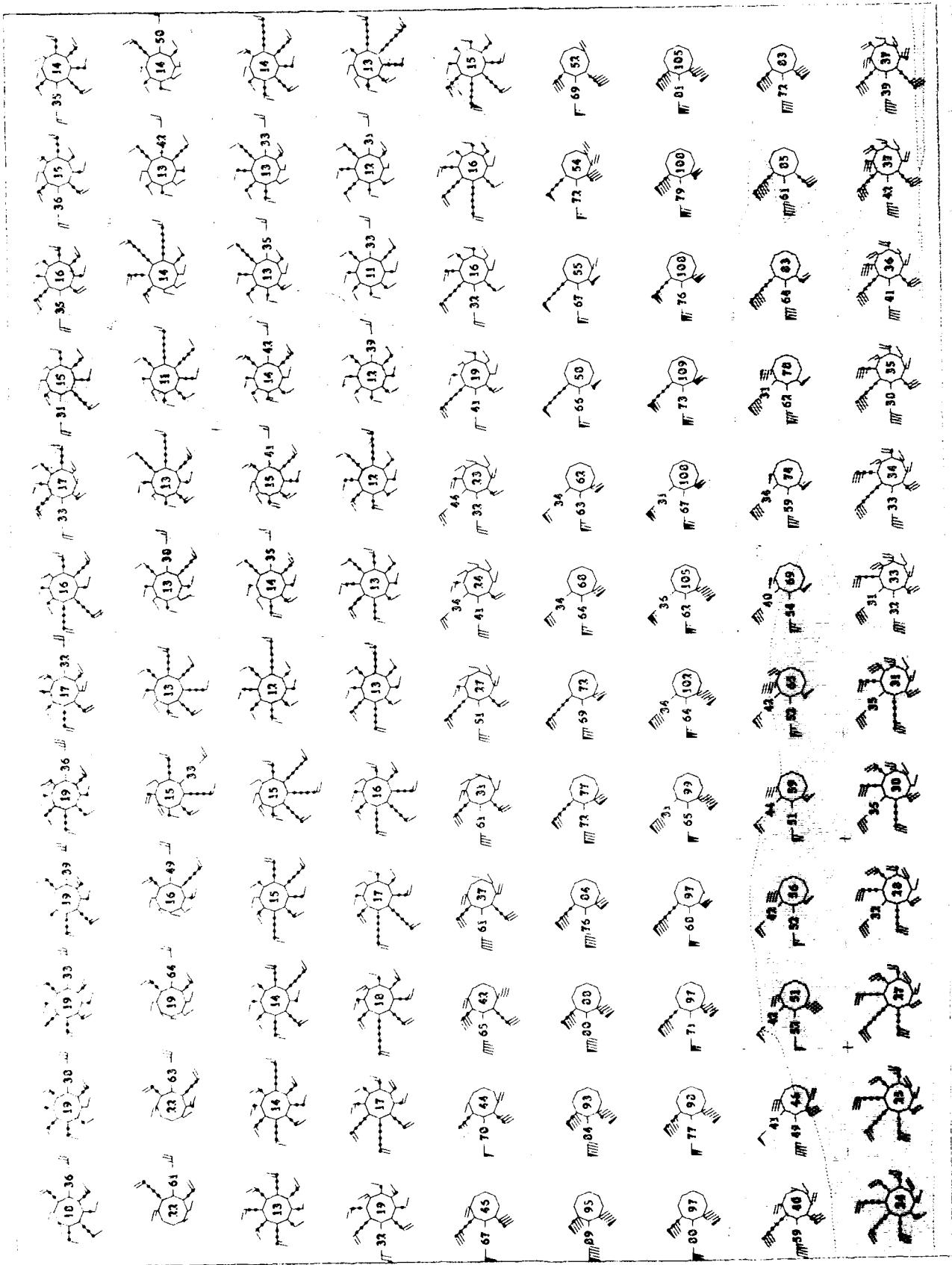




Upper Air Climatology
Southern Hemisphere

FIGURE 12
SOUTHERN HEMISPHERE
CLIMATOLOGY OF THE
UPPER AIR

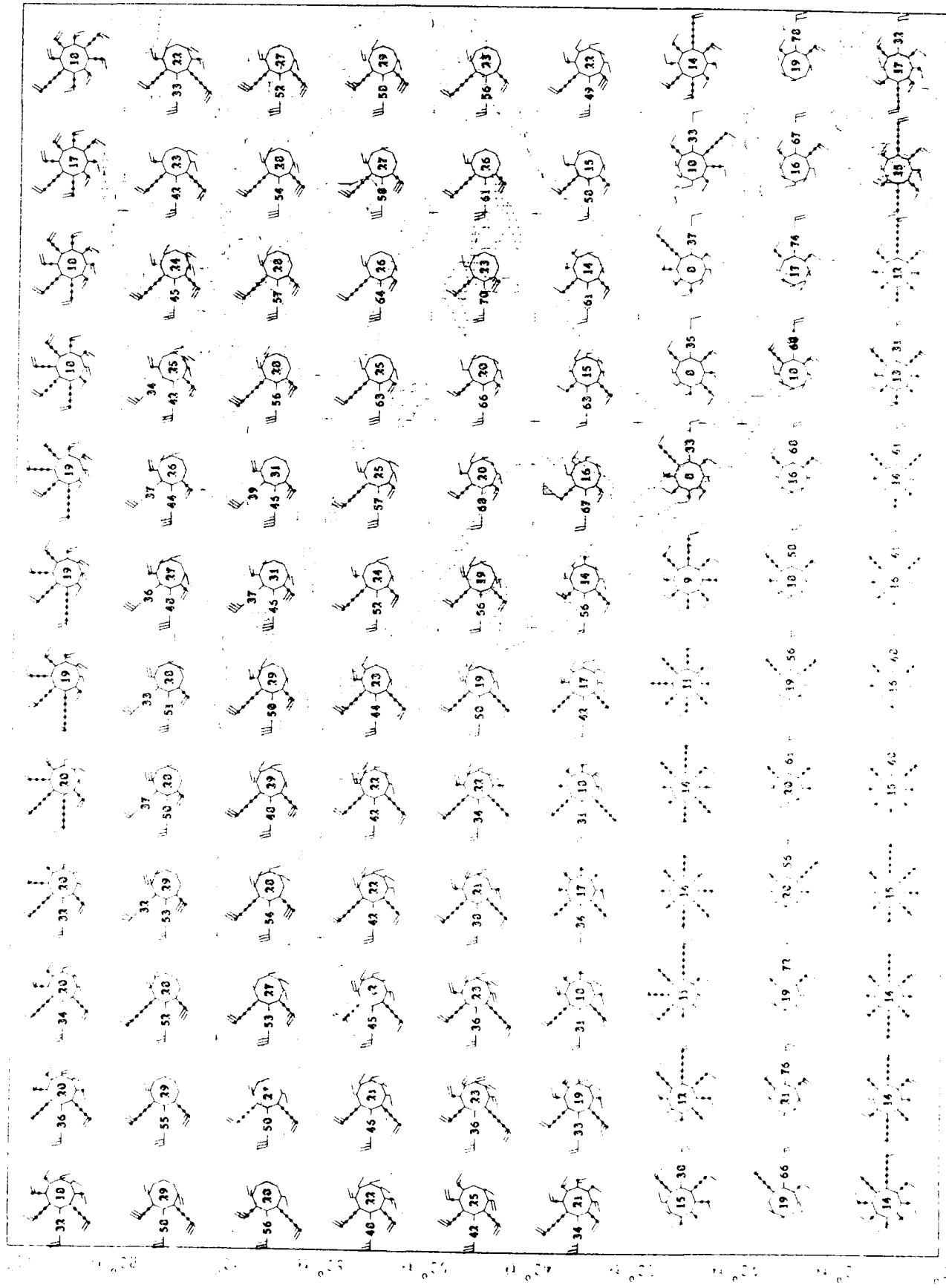
October
50 M.S.



Upper Air Geomagnetic
Northern Hemisphere

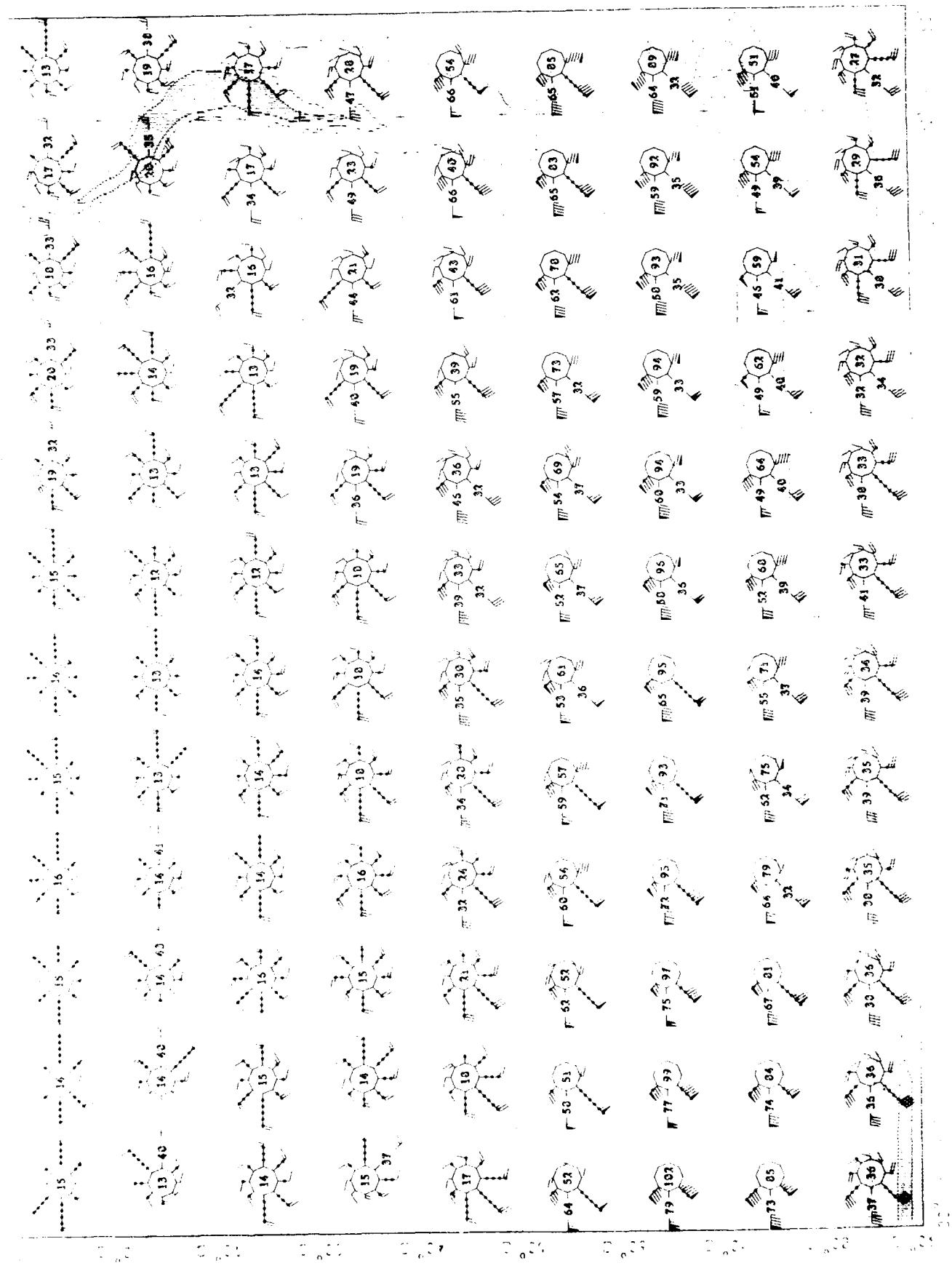
1950-1952

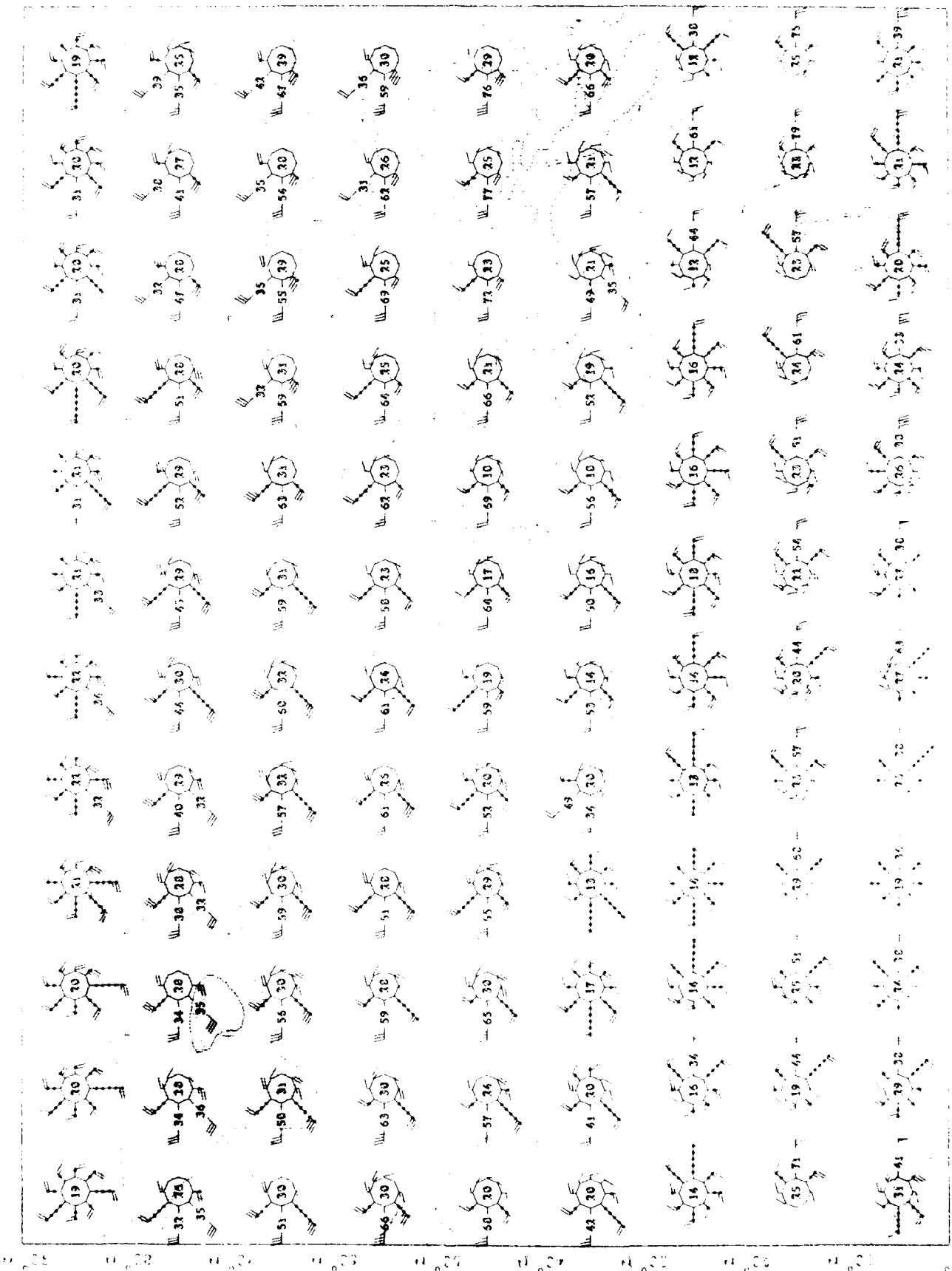
55 N.

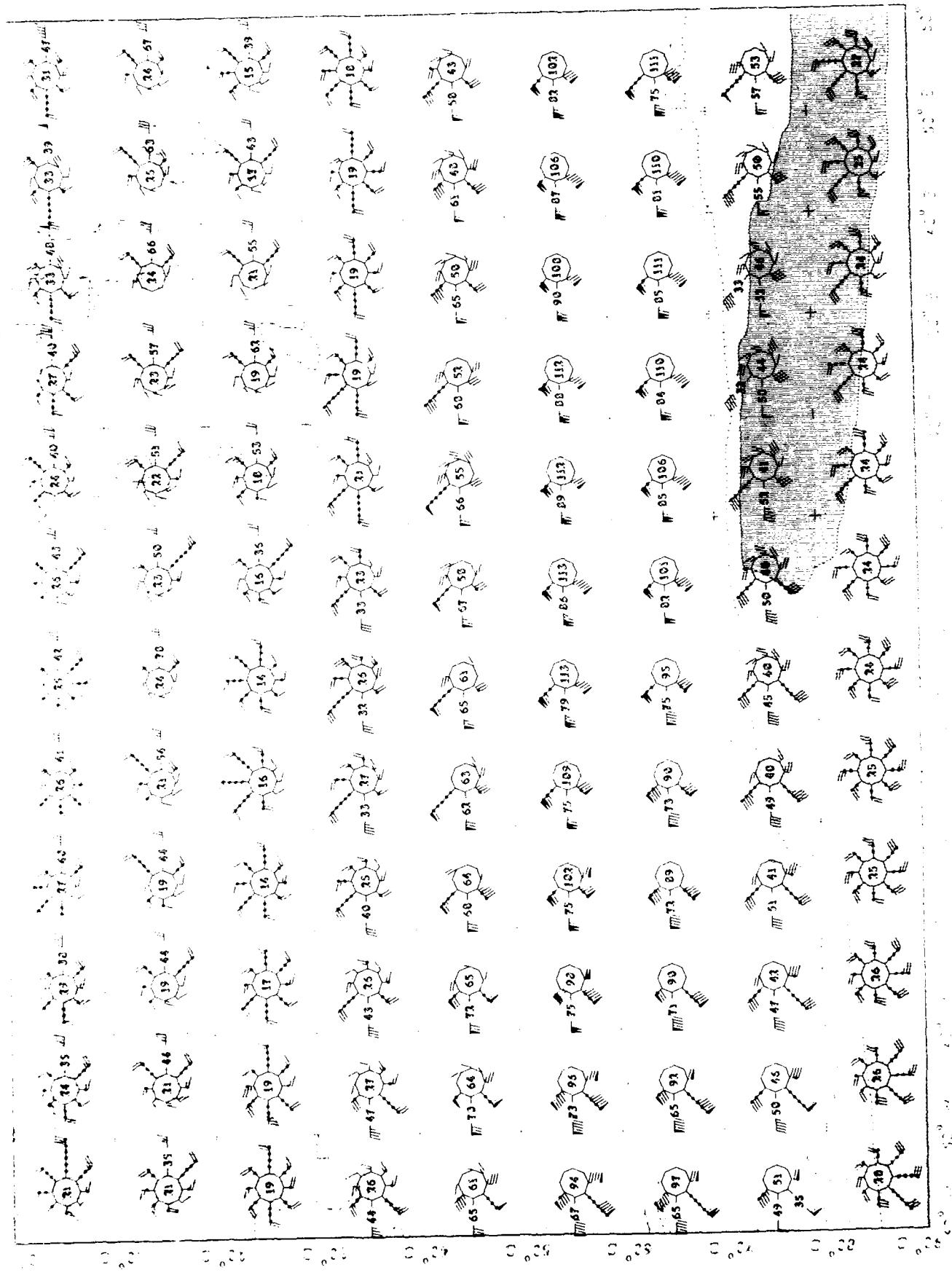


Upper Air Climatology
Southern Hemisphere

Oct 2011
S. J. H.



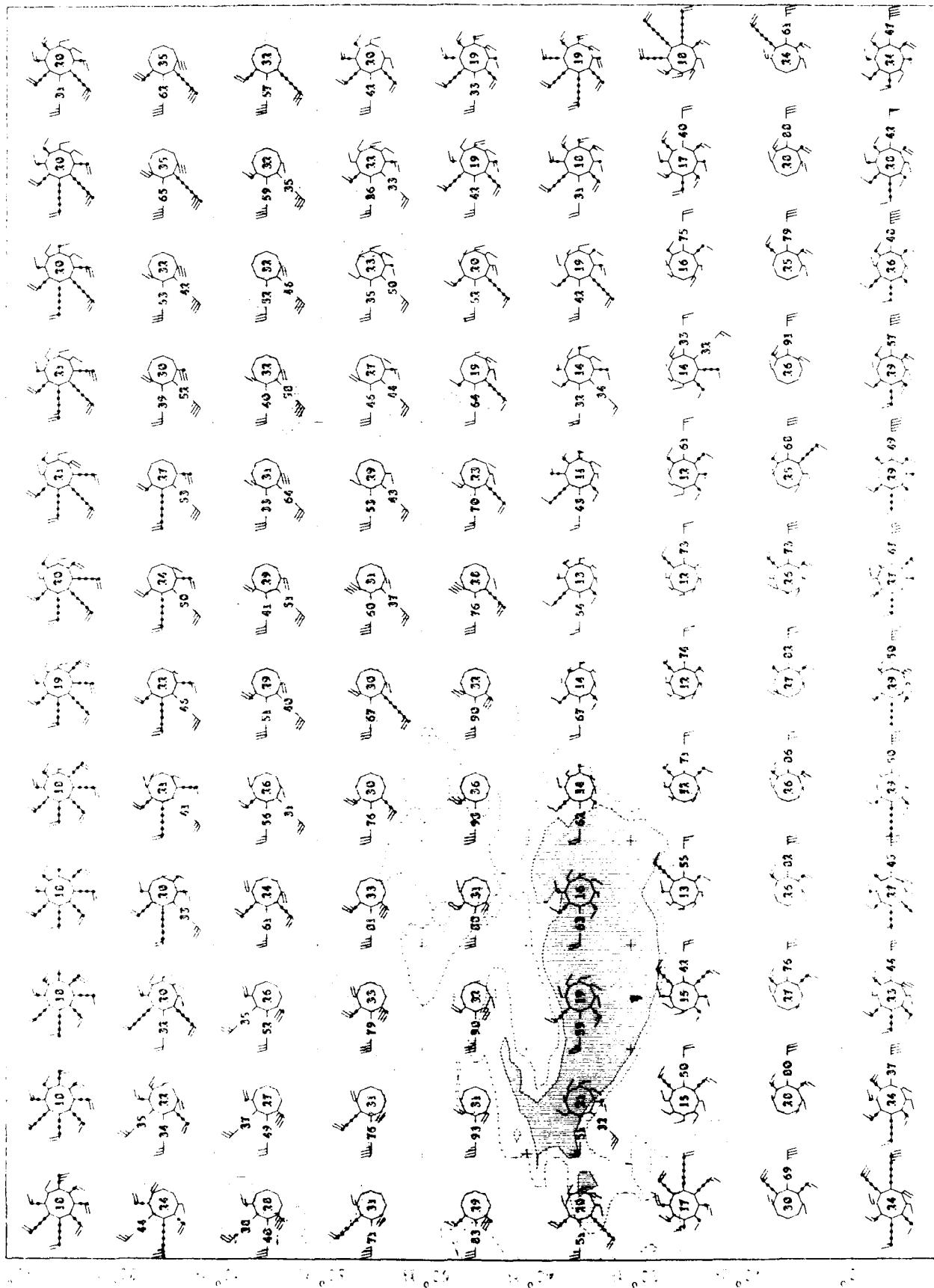




Octobre
30 M€

卷之三

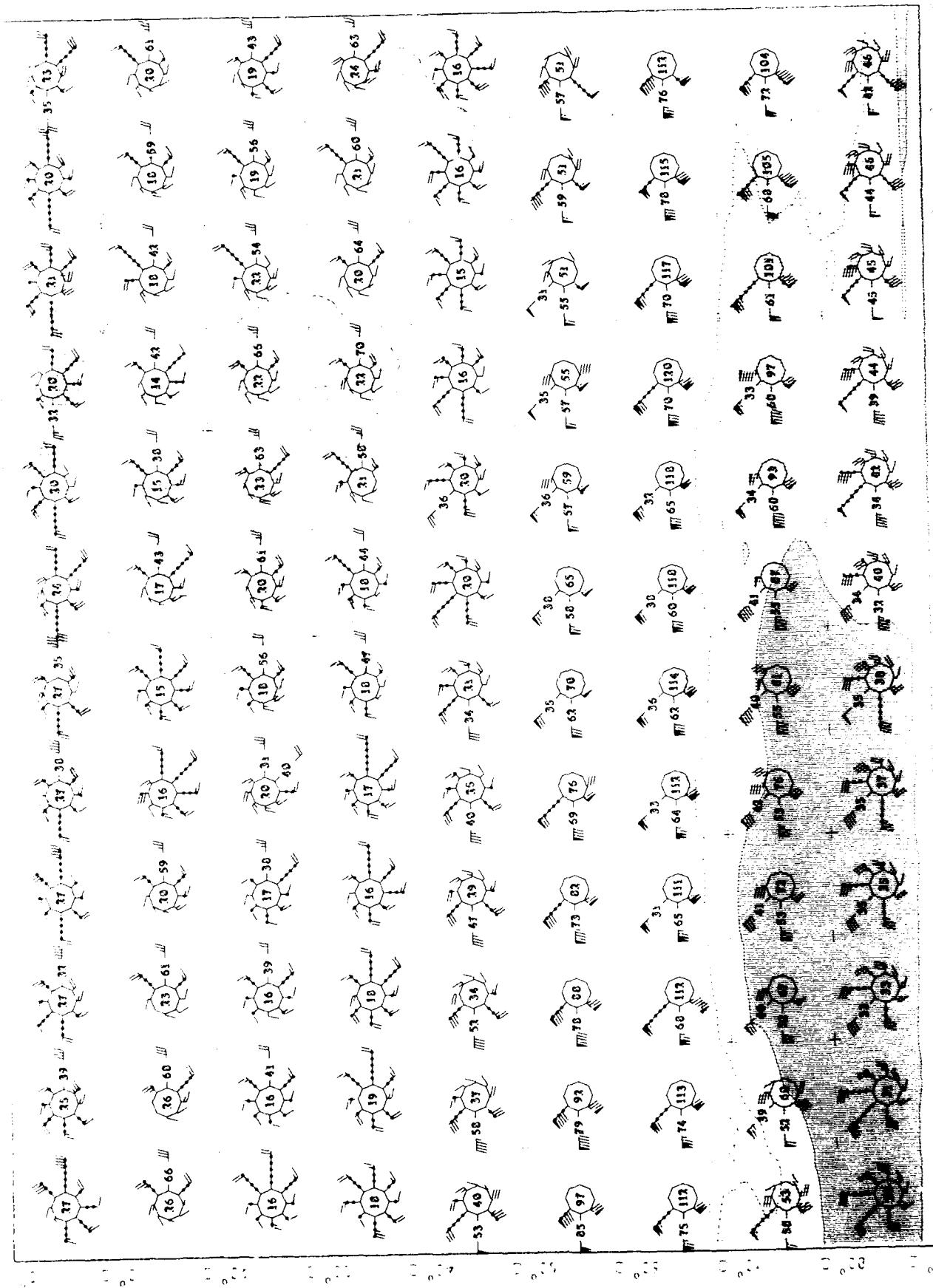
Upper Air Climatology Southern Hemisphere



Upper Air Climatology
Southern Hemisphere

Fig. 13-10
Oct. 1930

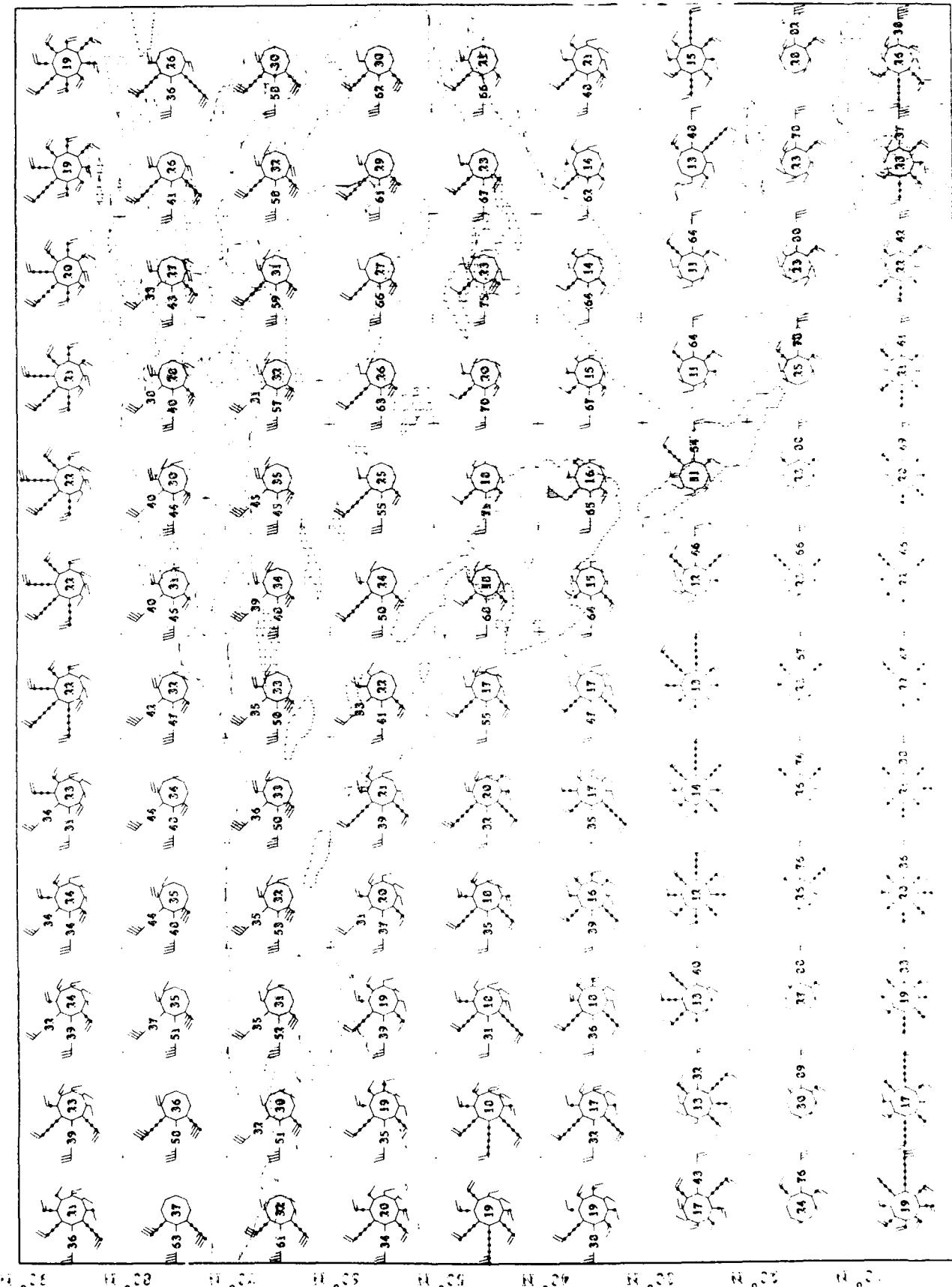
October
30 Min.

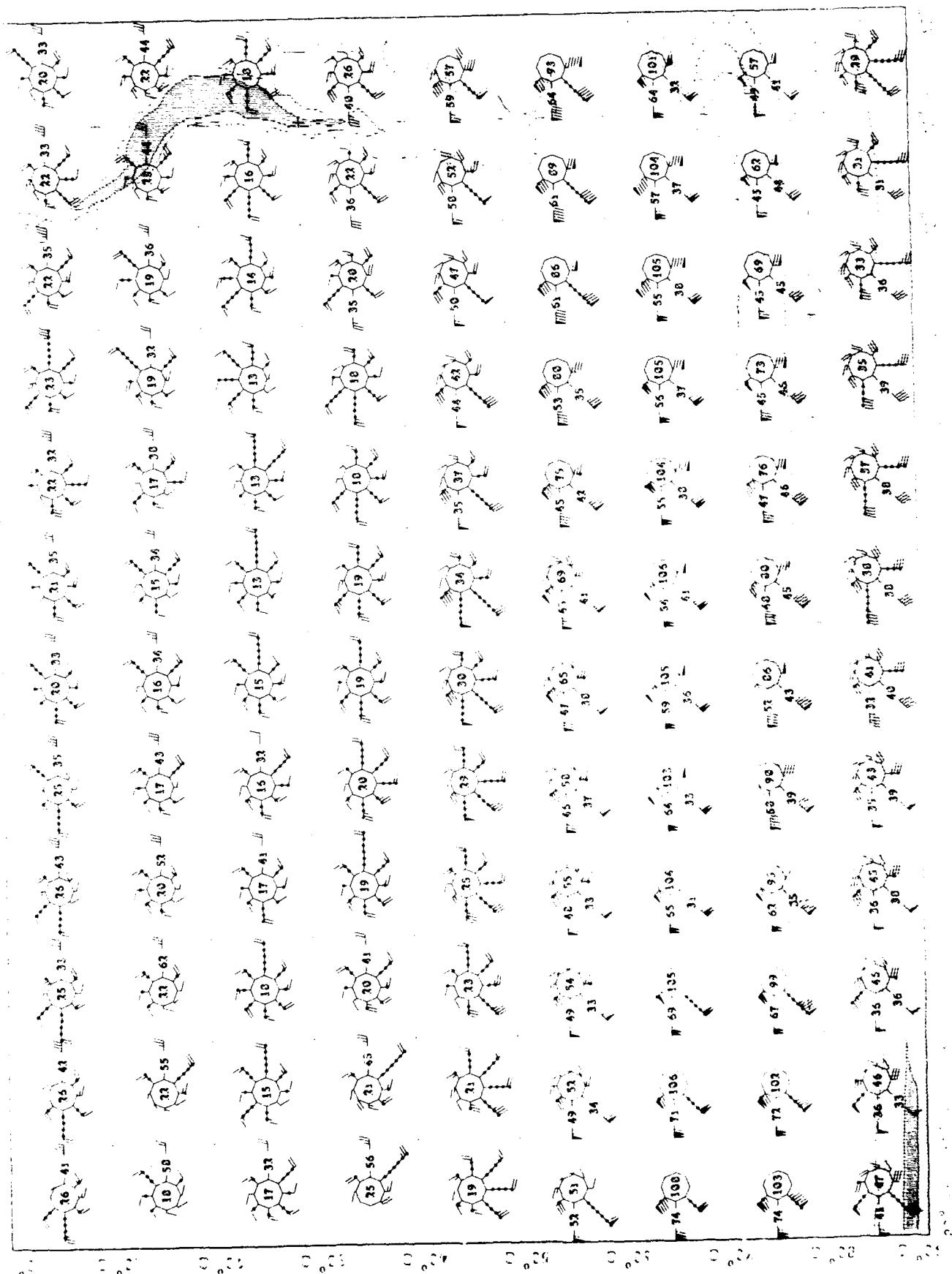


Map of 20 April 1960
Northern Hemisphere

Surface Pressure
900 mb

20 mb

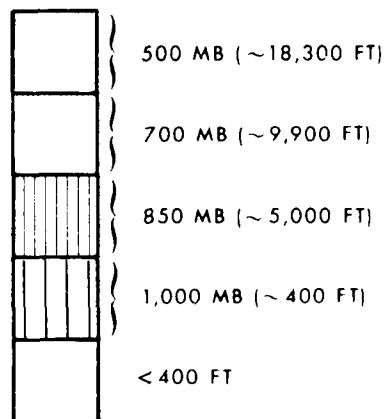




JET STREAM
(10 LEVELS, 500 TO 30 MB)

- Contours of mean scalar wind speed in knots
- Minimum mean scalar speed: 50 knots
- Contour interval of mean scalar speed: 25 knots

ELEVATION SCALE



see Discussion

Grant & Scott 1962

Wright et al.

1970

Upper Air Climatology

Northern Hemisphere

10°

50°

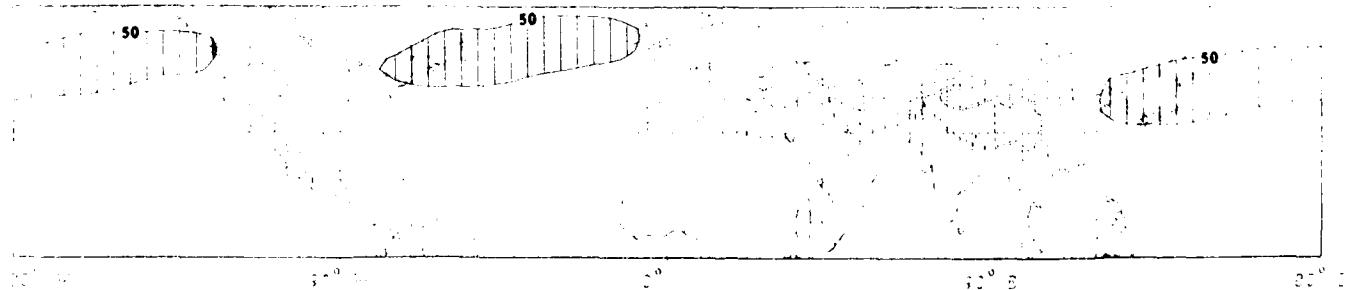
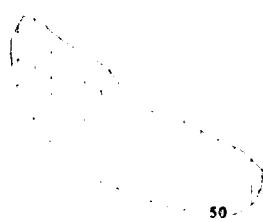
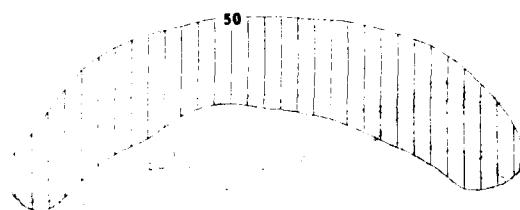
Upper Air Climatology
Synthetic Aperture

jet stream
Cloud & Particles
Rotated
GPI RDI



Jet Stream
Cloud + 25kt inc
October
400 mb

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology

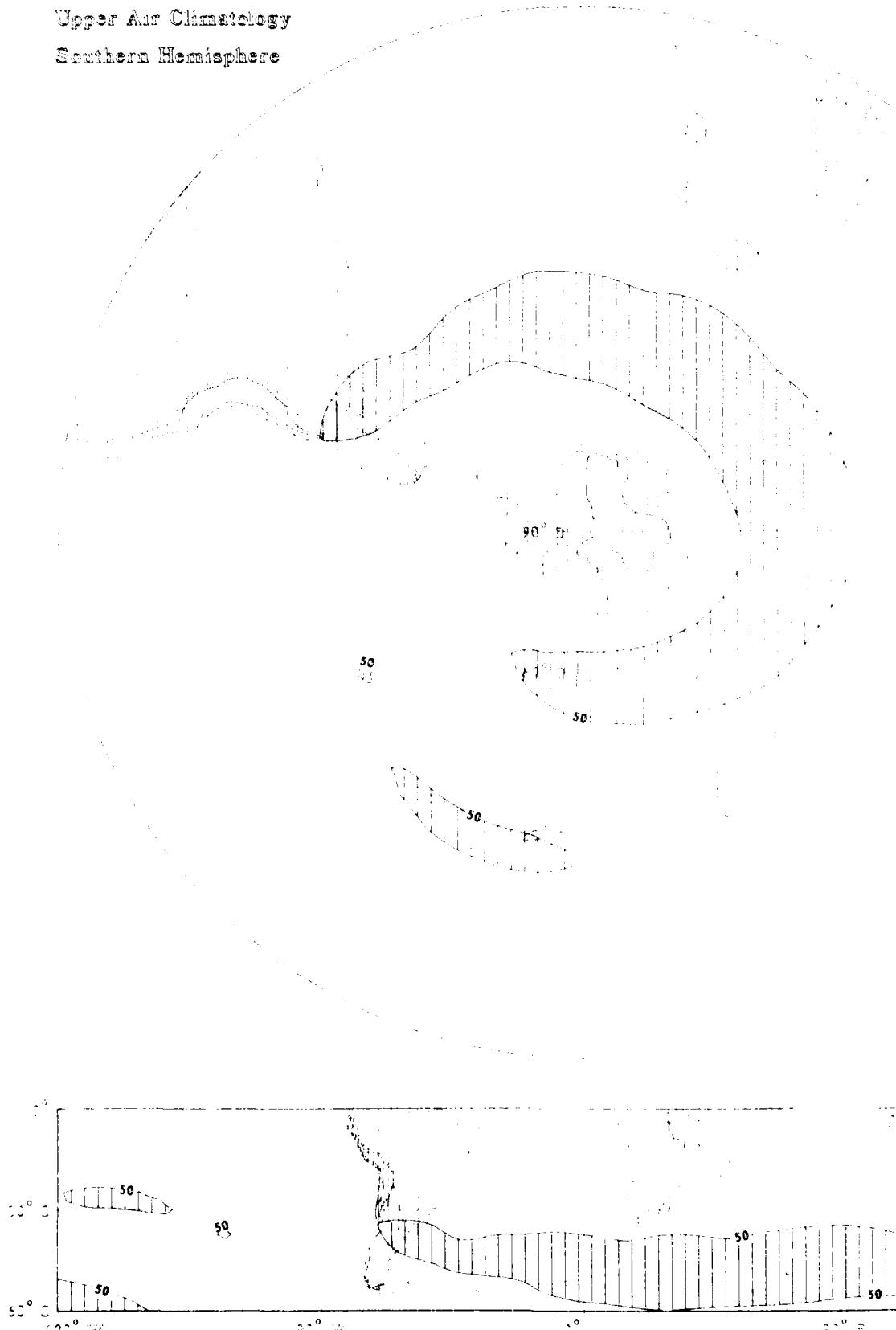
Southern Hemisphere

Jet Stream

50kt + 25kt inc

October

600 mb



Jet Stream
50°N + 25°E long
October
9.11 mb

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology

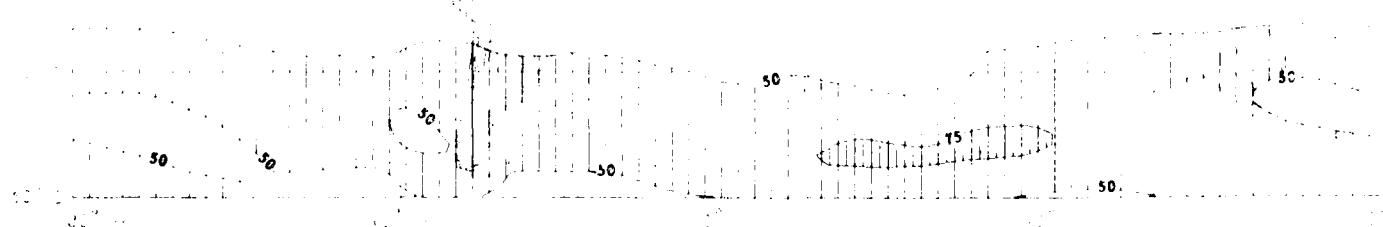
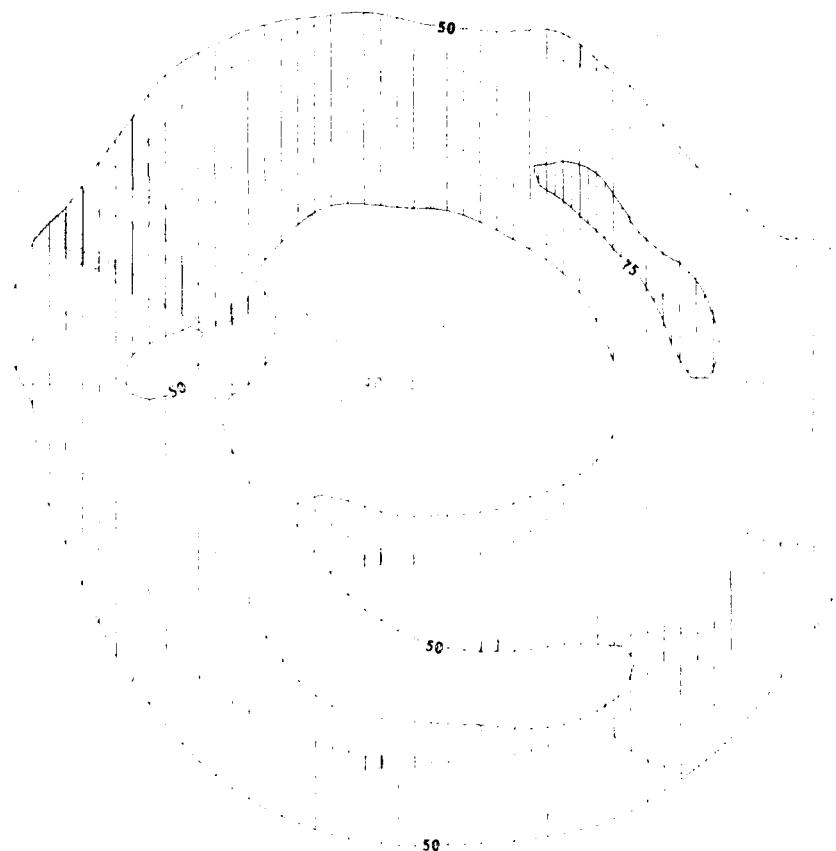
Northern Hemisphere

Net Circum.

SUM + 15% and

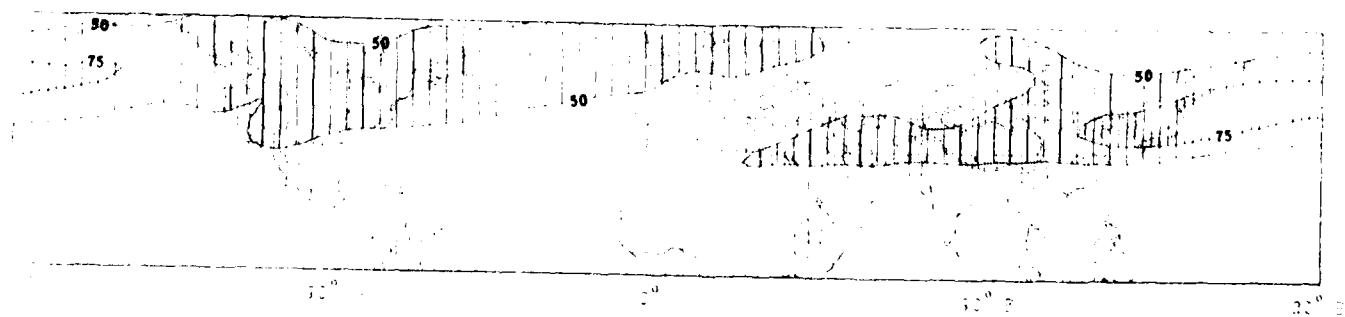
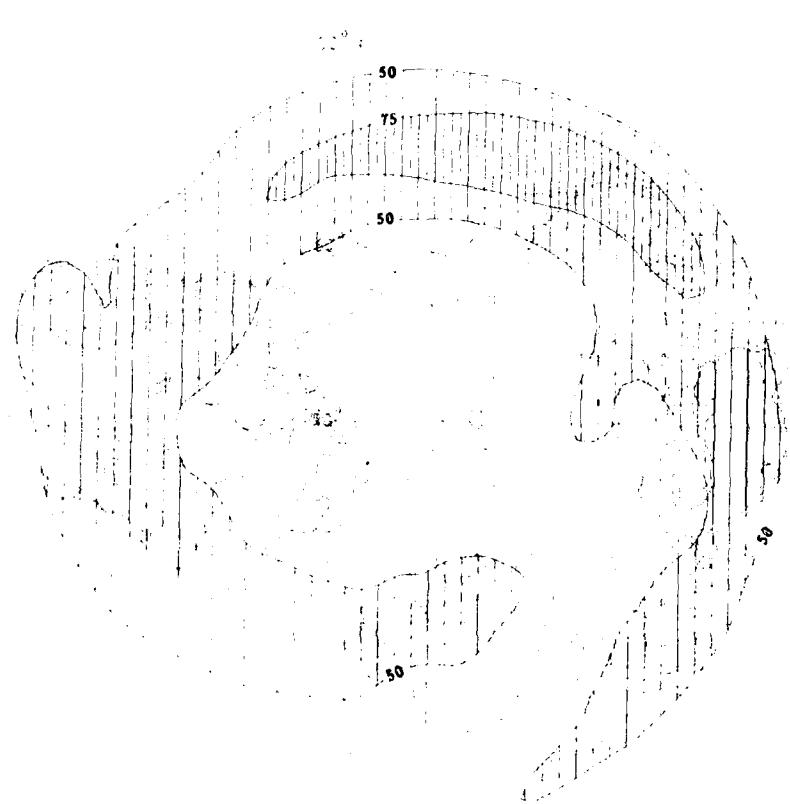
Others

115 MM



Jet Stream
Chart + 15kt line
October
1952 N.H.

Upper Air Climatology
Northern Hemisphere



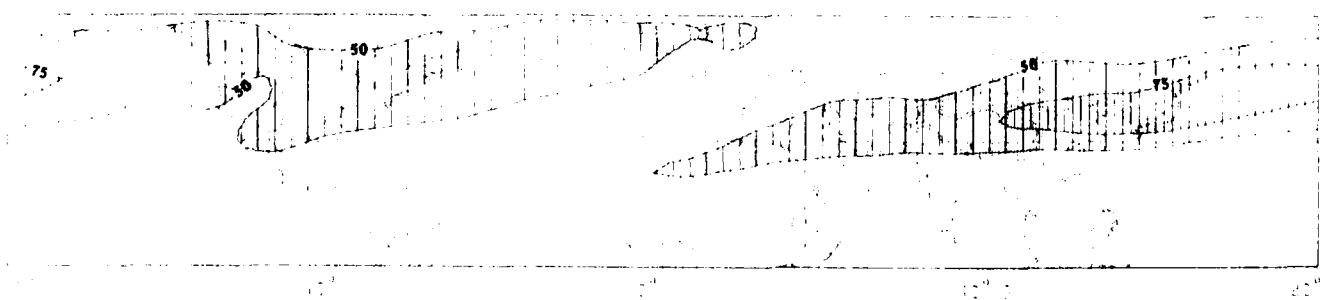
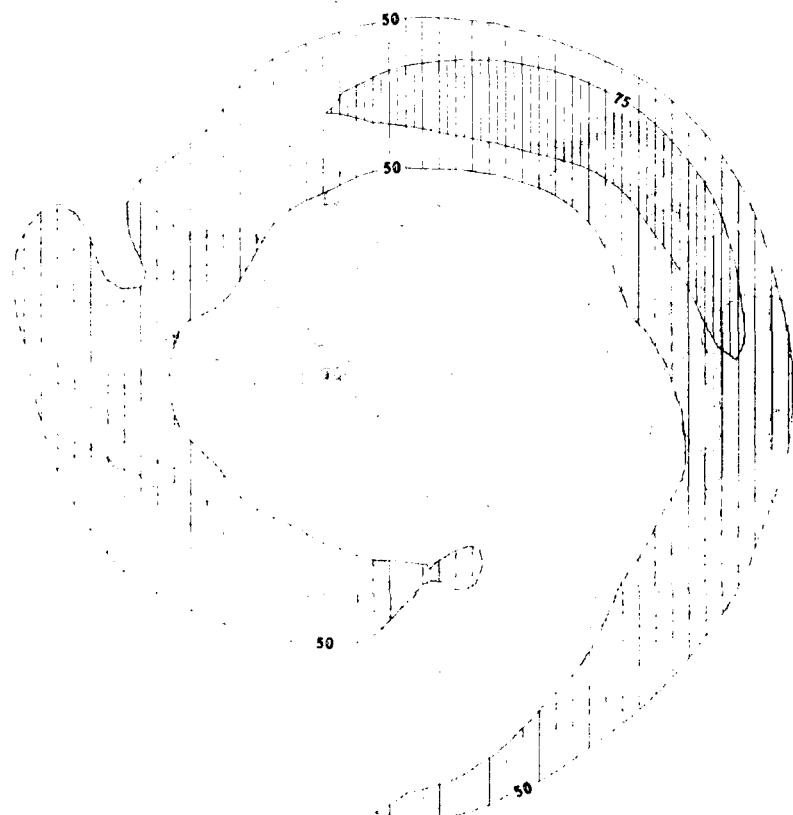
Type A and B hematology
Complete Hematology

3000 rpm
50 ml + 15 ml sucrose
notched
650 rpm



Int. Bureau
Coll. & Joint Inv.
October
1951

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology

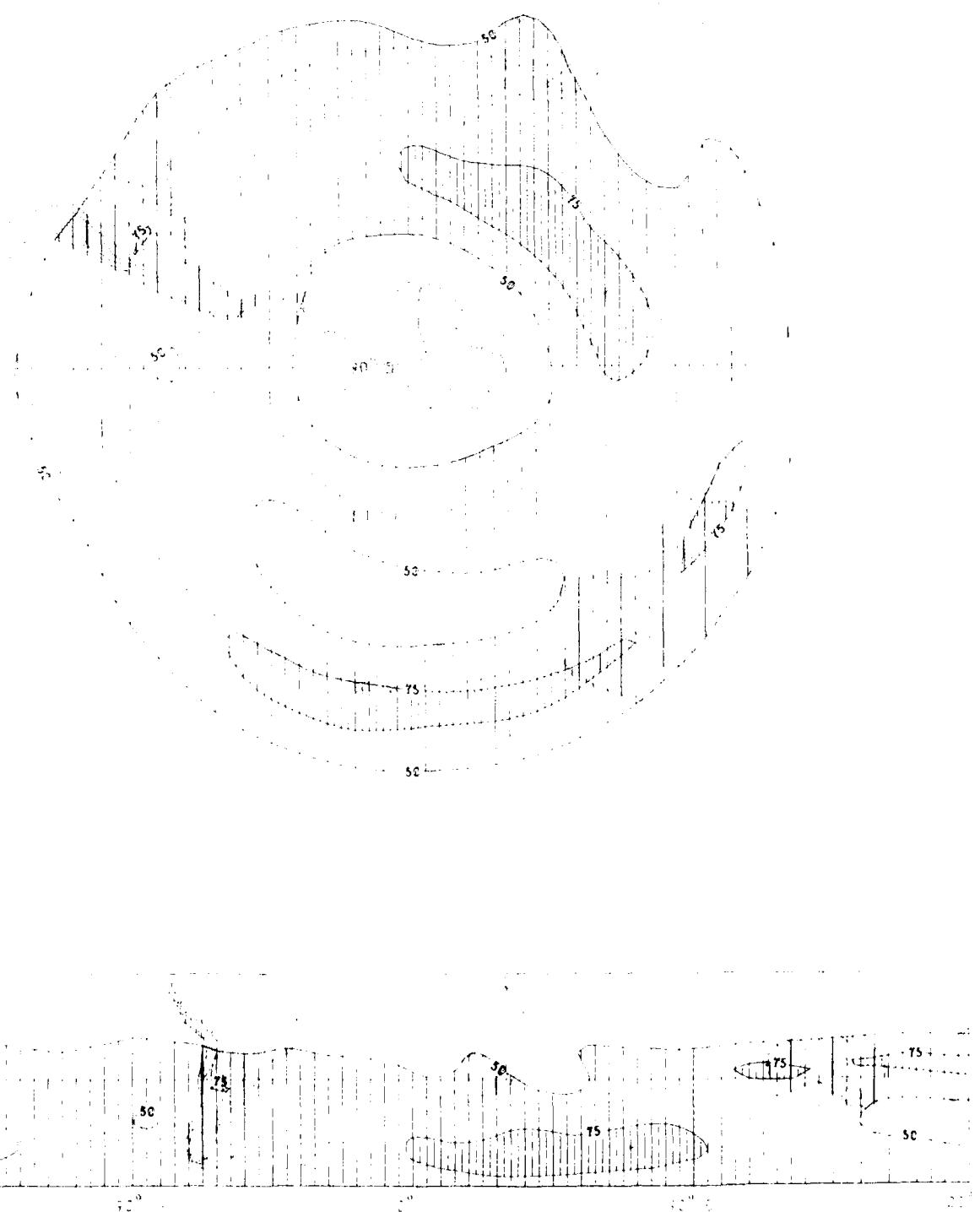
Northern Hemisphere

Jet Stream

50 km + 25 km and

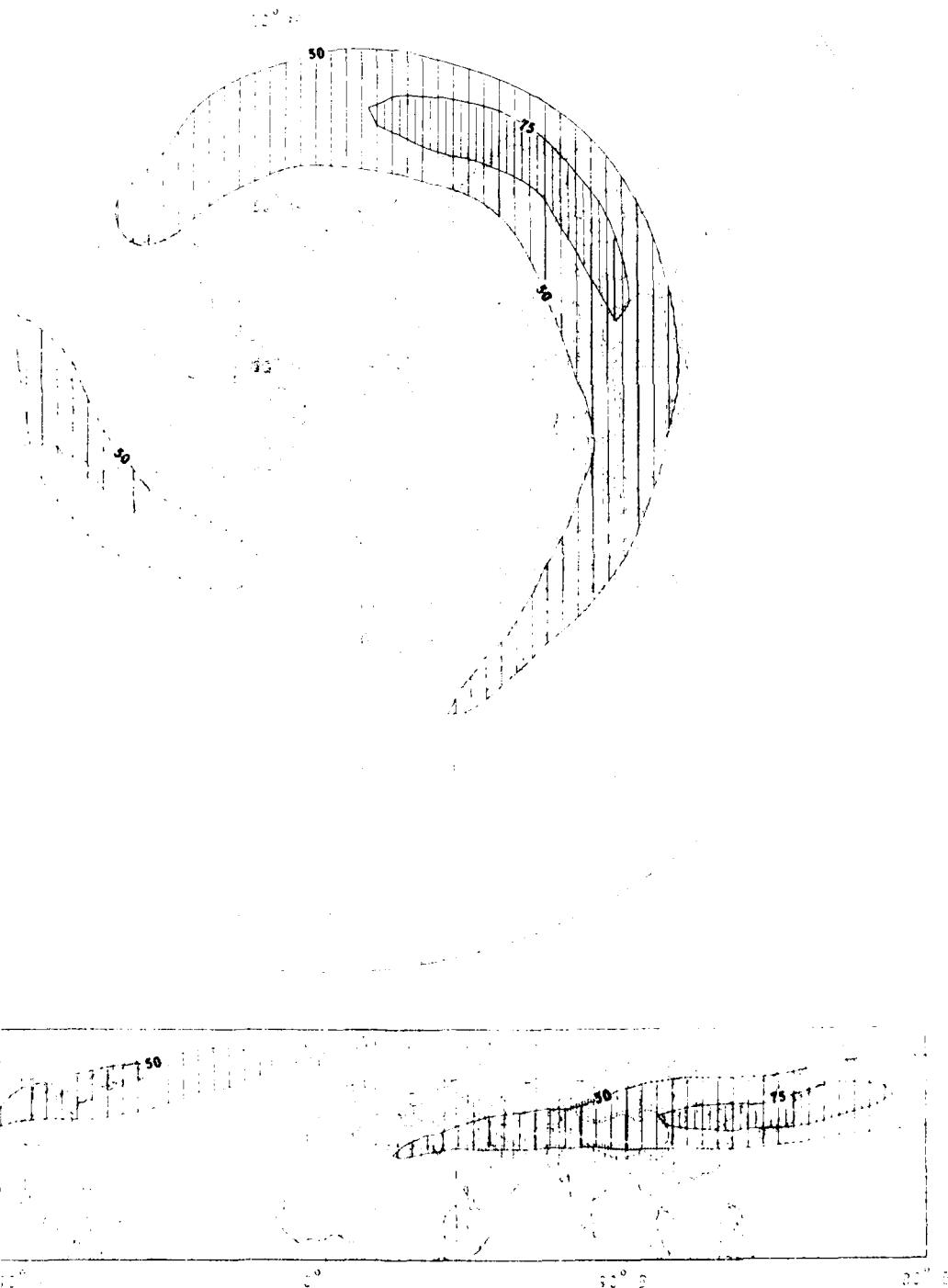
October

45° N



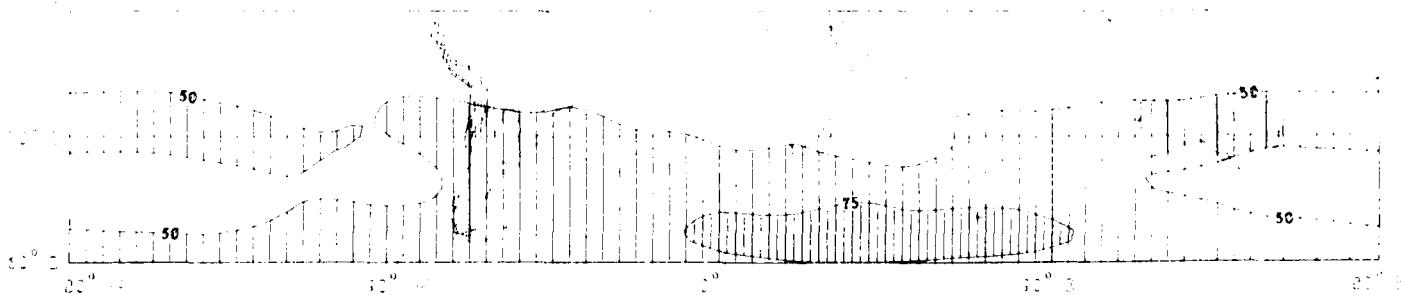
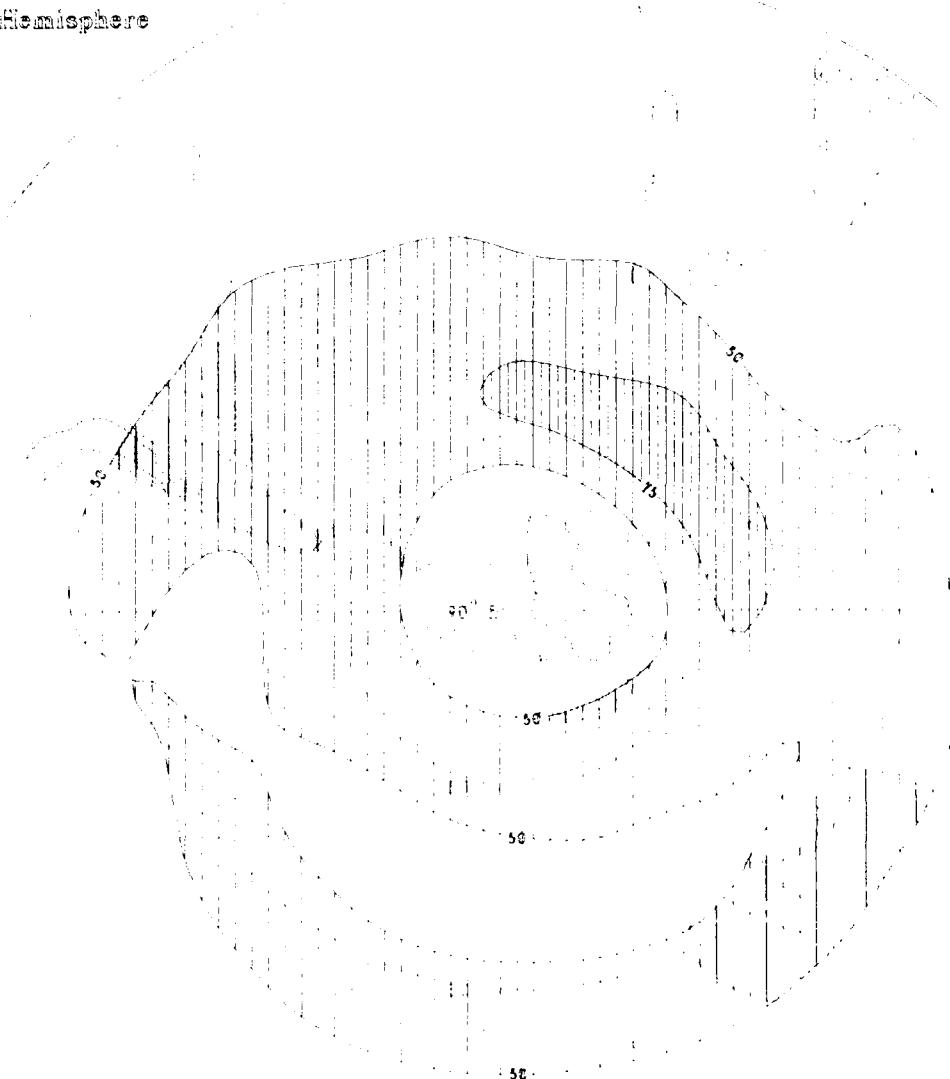
Pet Stream
50kt + 25kt inc
October
100 MB

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Jet Stream
50kt + 25kt max
October
150 mb



Jet Stream

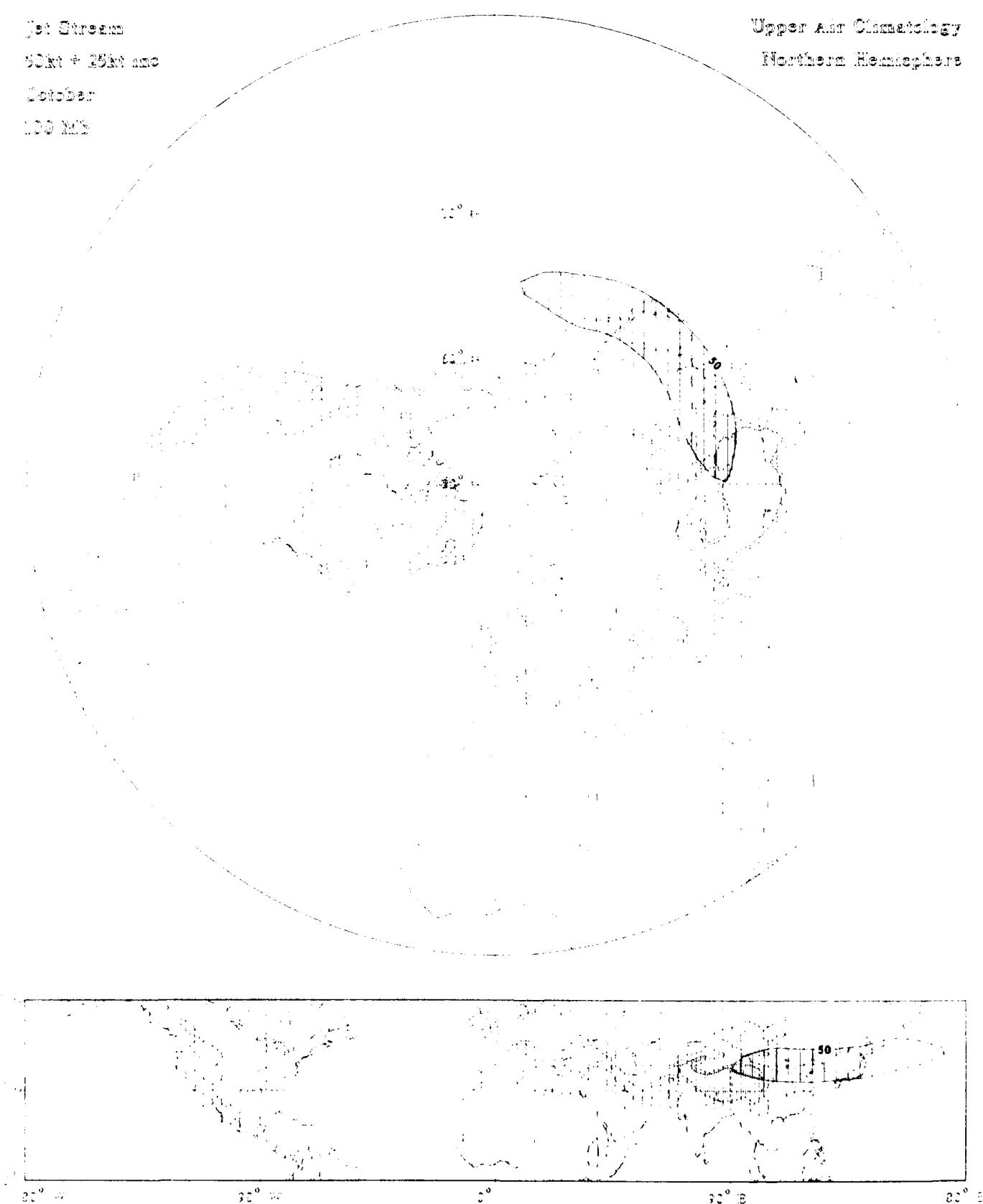
50kt + 25kt inc

October

100 MB

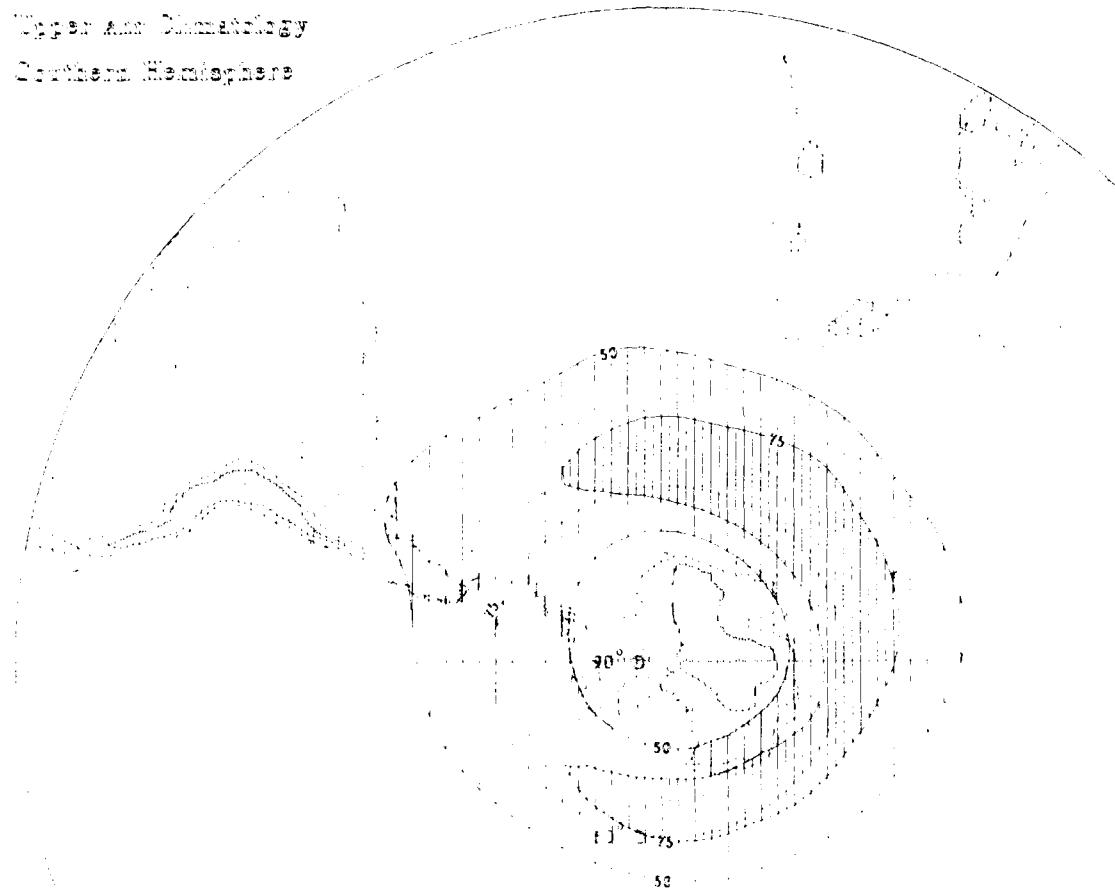
Upper Air Climatology

Northern Hemisphere

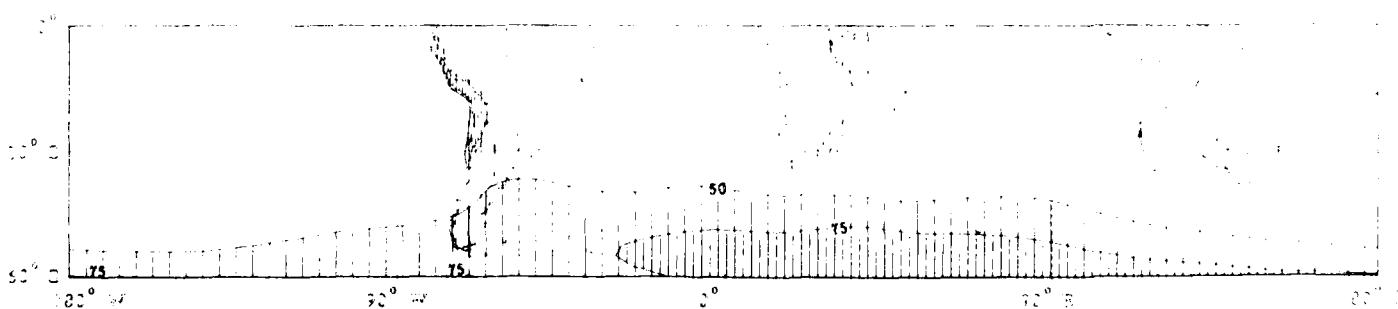


Upper Air Climatology
Northern Hemisphere

Jet Stream
5000 ft ASL and
Clouds
2000 m



50



Jet Stream

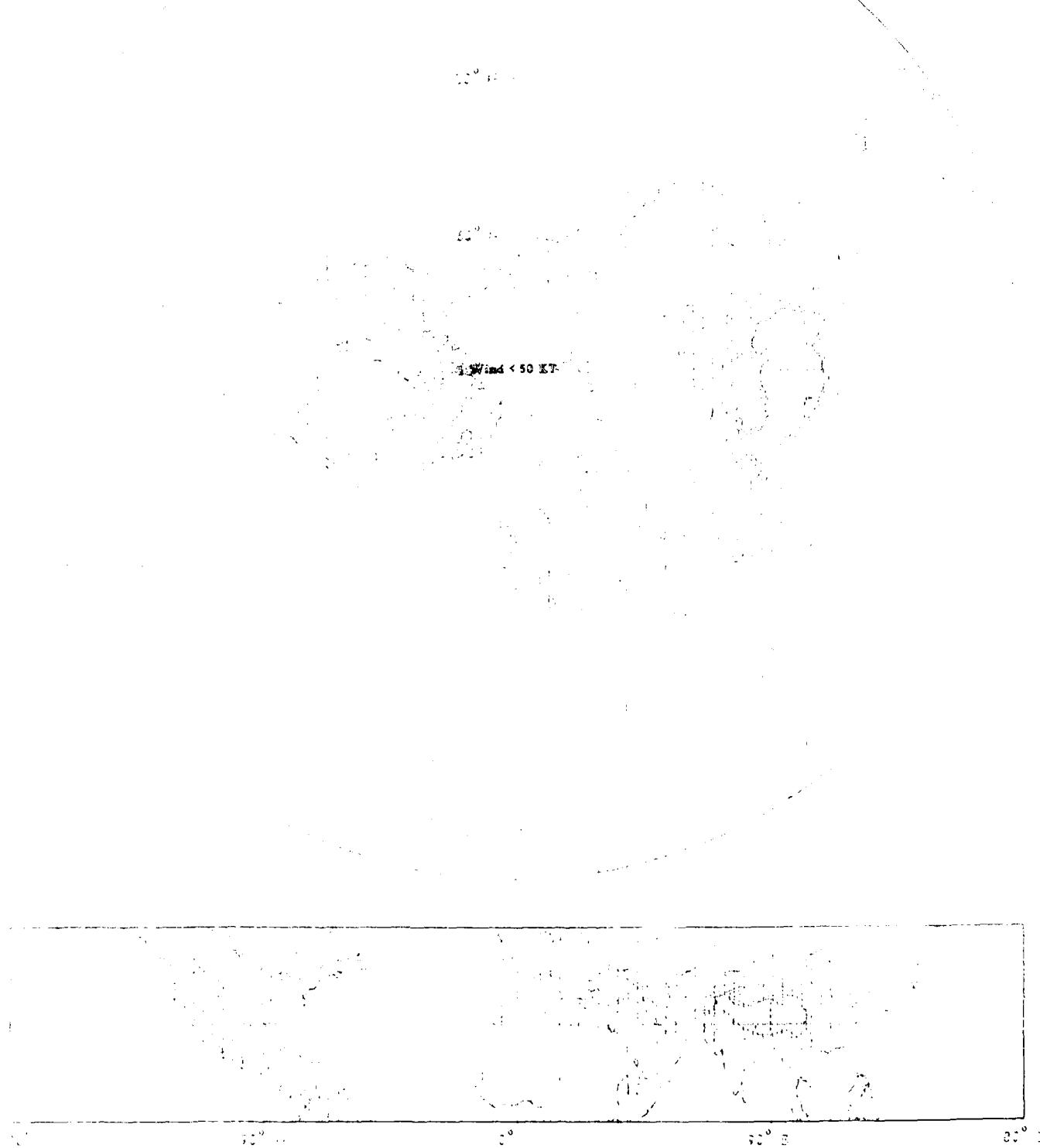
Chart + Data and

Notes

1000 mb

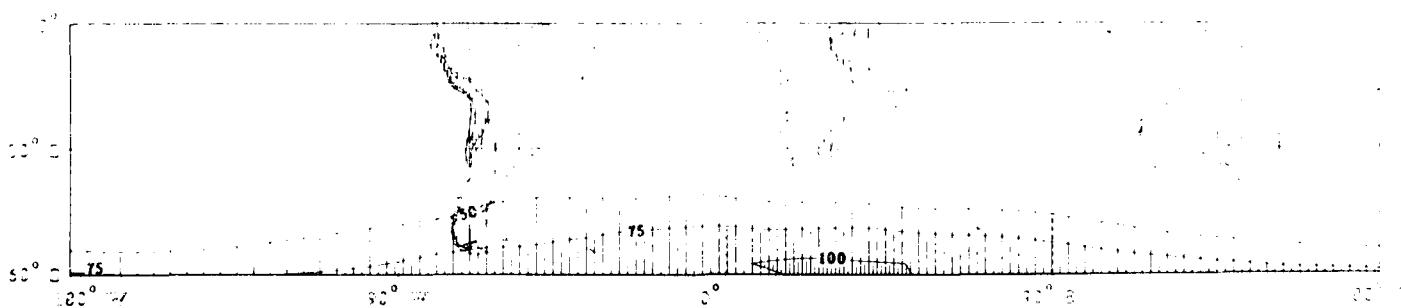
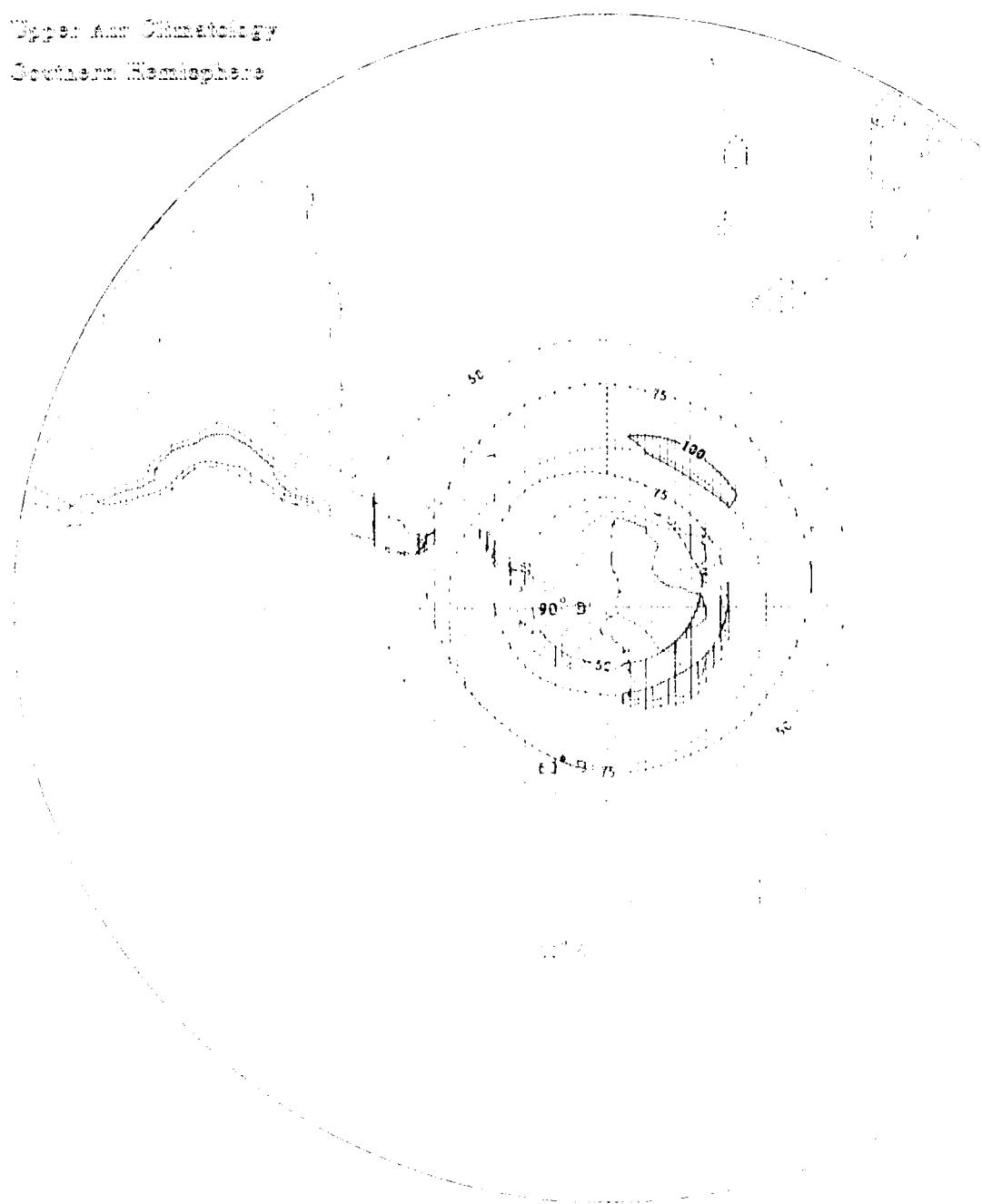
Upper Air Climatology

Northern Hemisphere



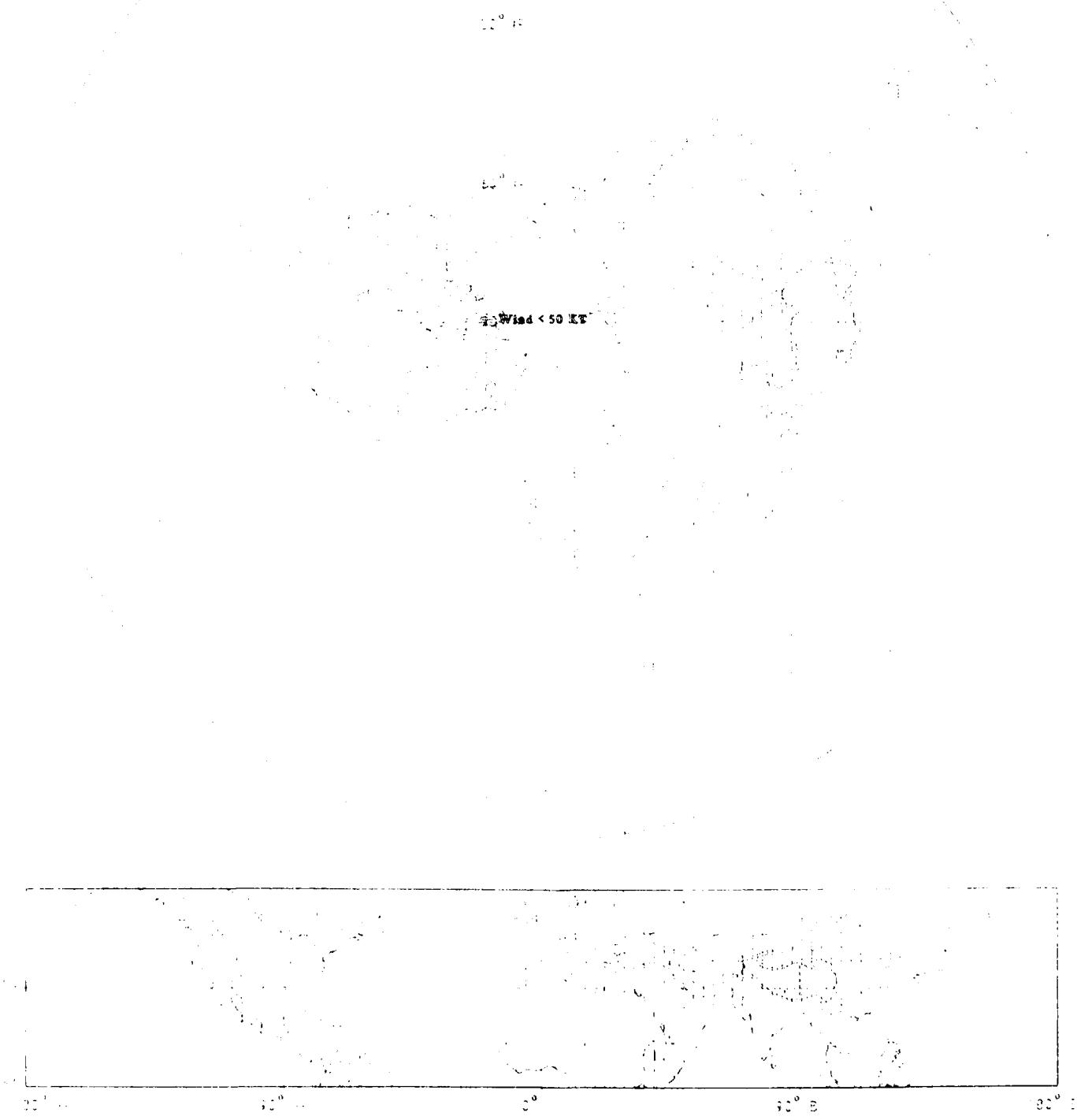
Upper Air Climatology
Southern Hemisphere

30 Dec
1950 - 1951
100 mb
1000 mb
1000 mb
100 mb



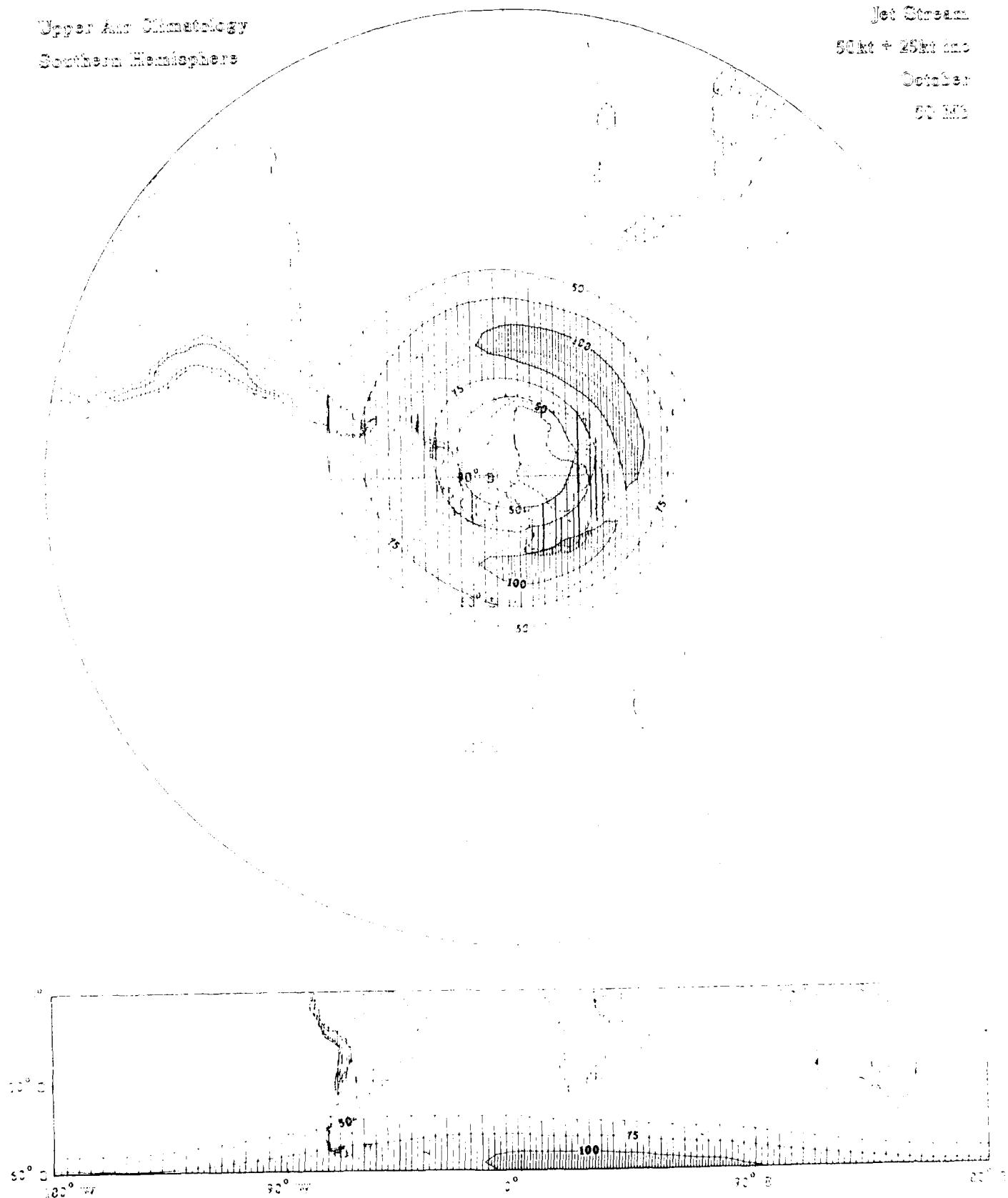
Jet Stream
Wind & Wind Shear
Joule
S. M.

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Jet Stream
50kt + 25kt inc
October
50 mb



Jet Stream
50kt + 25kt inc
October
30 Mb

Upper Air Climatology
Northern Hemisphere

60° N
Wind < 50 KT

Upper Air Climatology

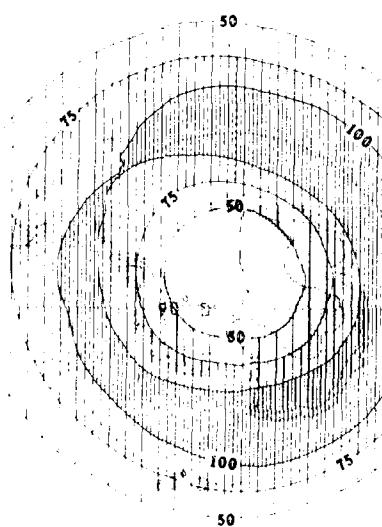
Southern Hemisphere

jet stream

50°S + 25°N and

100°E

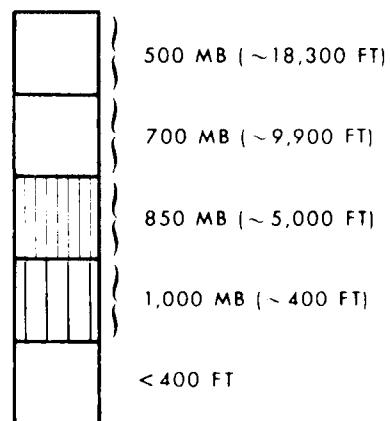
1100



TEMPERATURE
(13 LEVELS, 1000 TO 30 MB)

- Contours of mean temperature (solid and dashed lines) in °C; solids labeled, dashed intermediates unlabeled
- Temperature labeled interval: 5°C
- Contours of standard deviation of temperature (dotted lines) in °C
- Standard deviation of temperature labeled interval: 2.5°C
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE

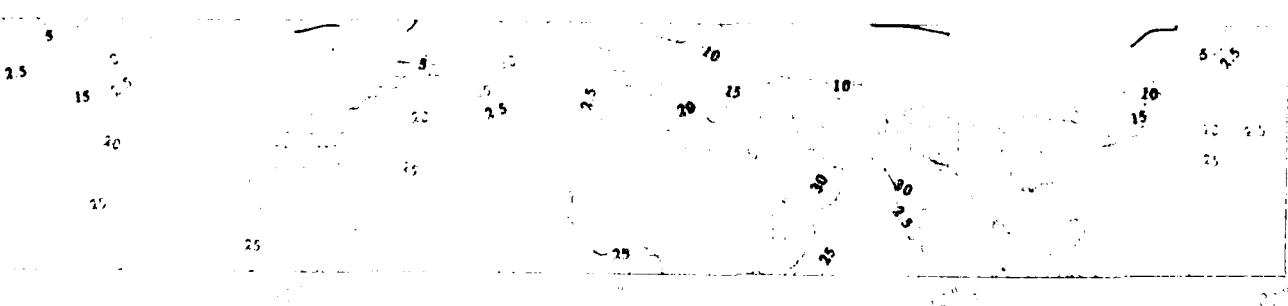
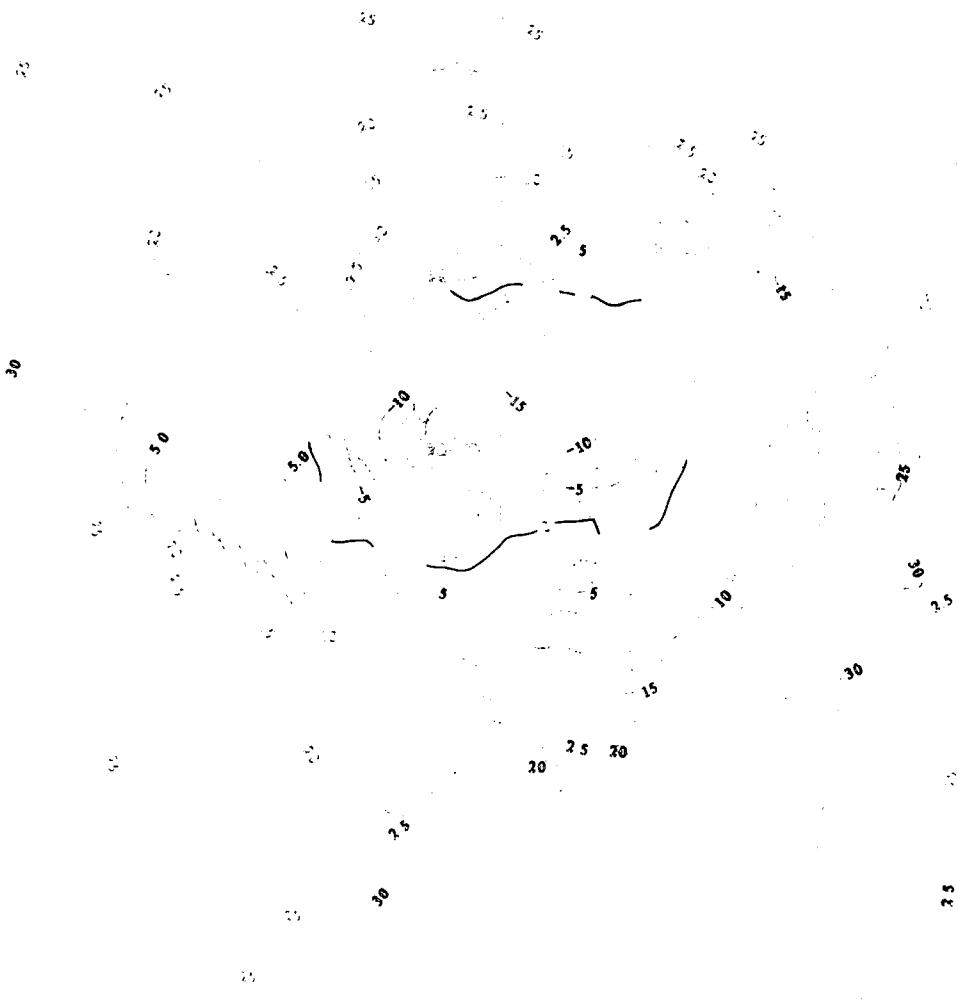


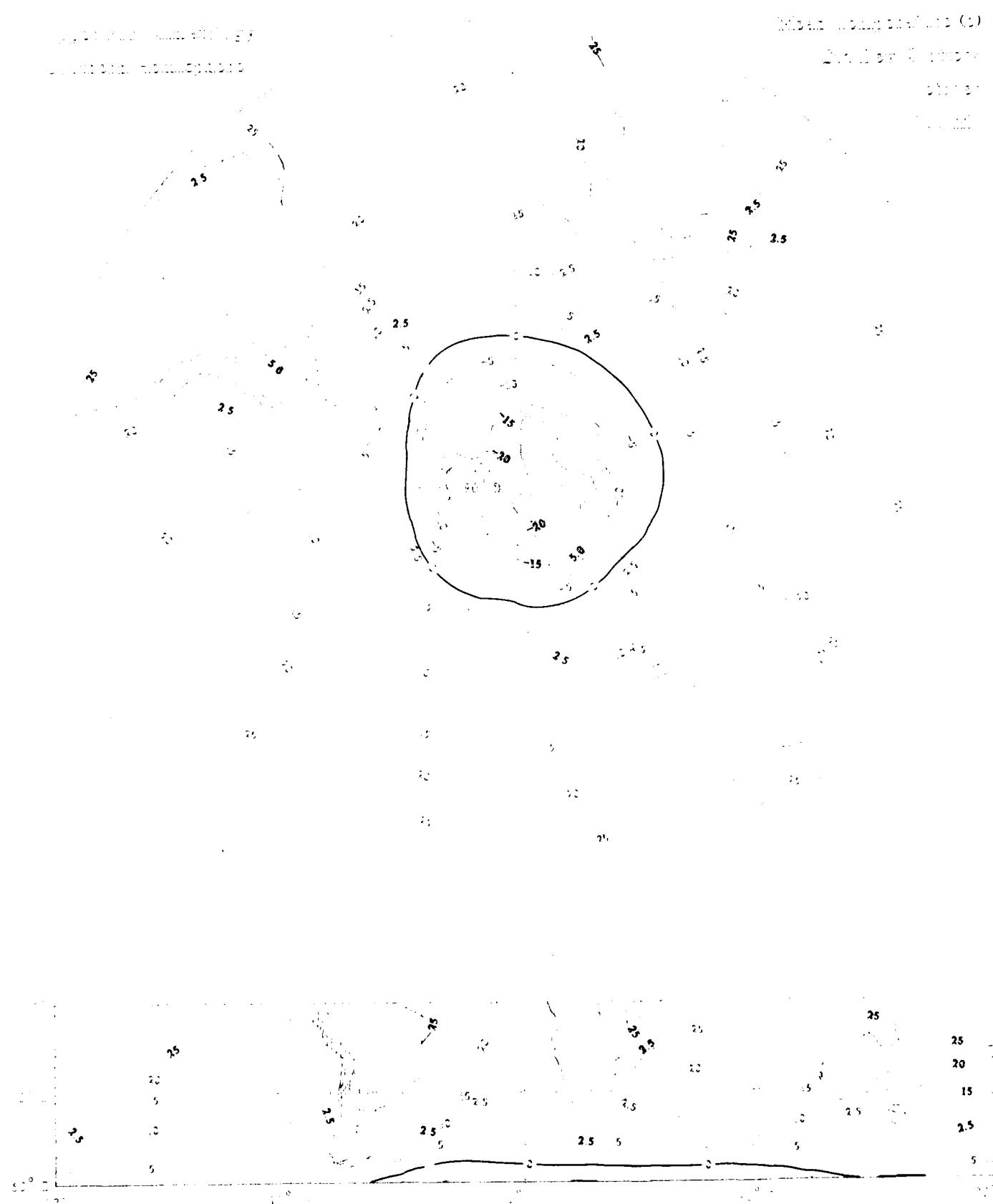
APPENDIX C

REFERENCES

REFERENCES AND NOTES

三





Indian Ocean section (c)

20° S - 20° N

120° E

120° W

Fig. 22. East longitude

Meridional Hydrography

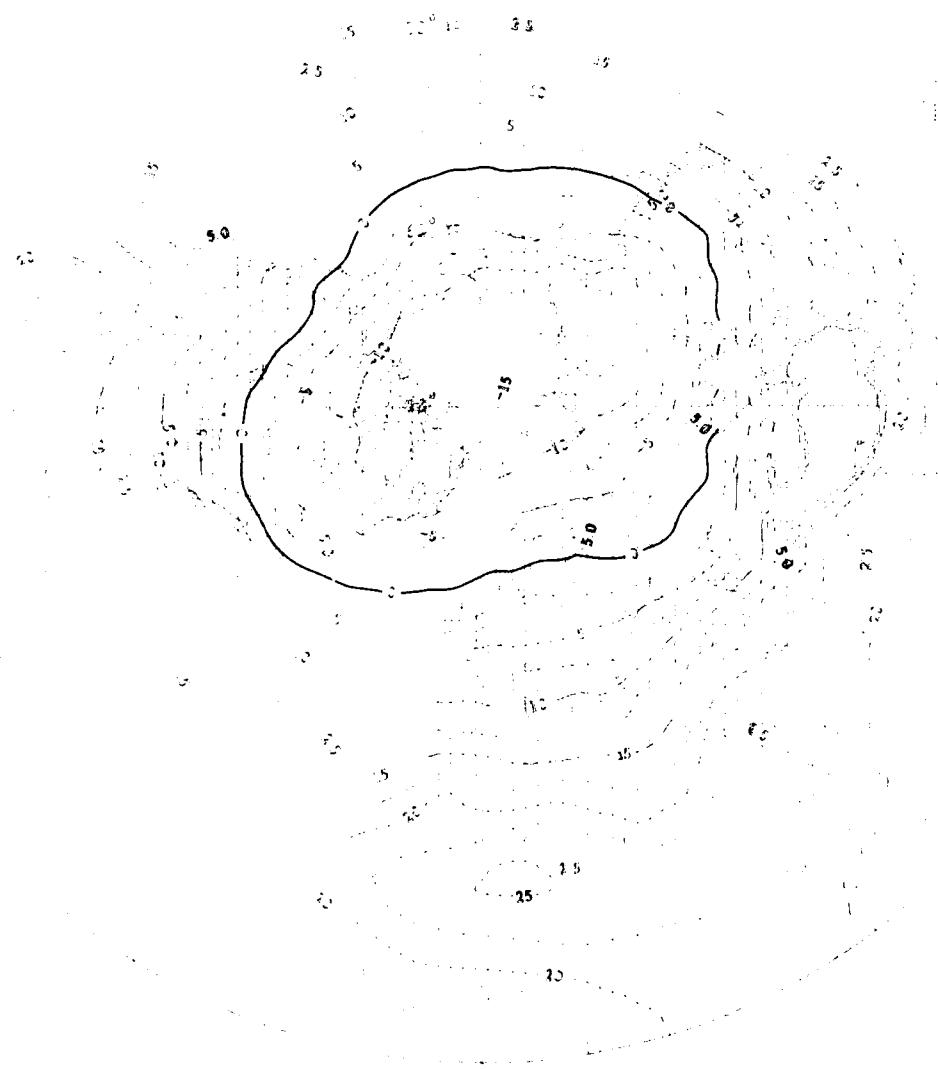


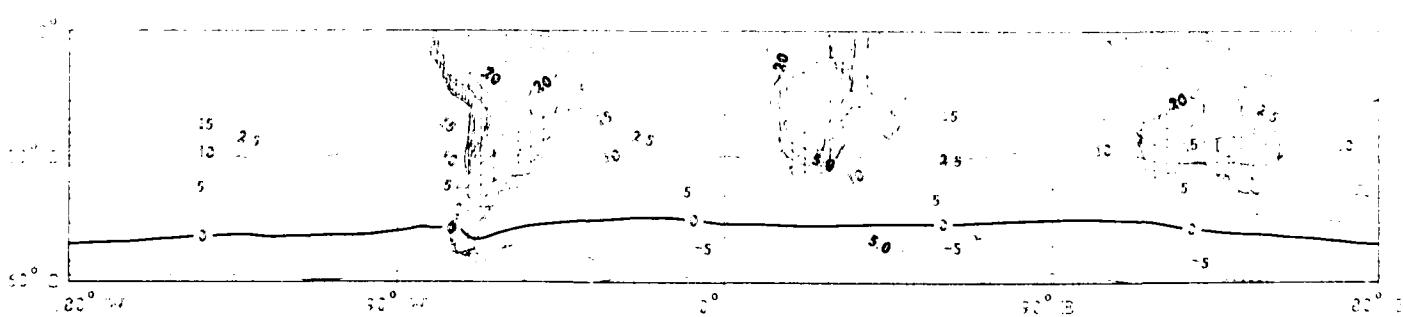
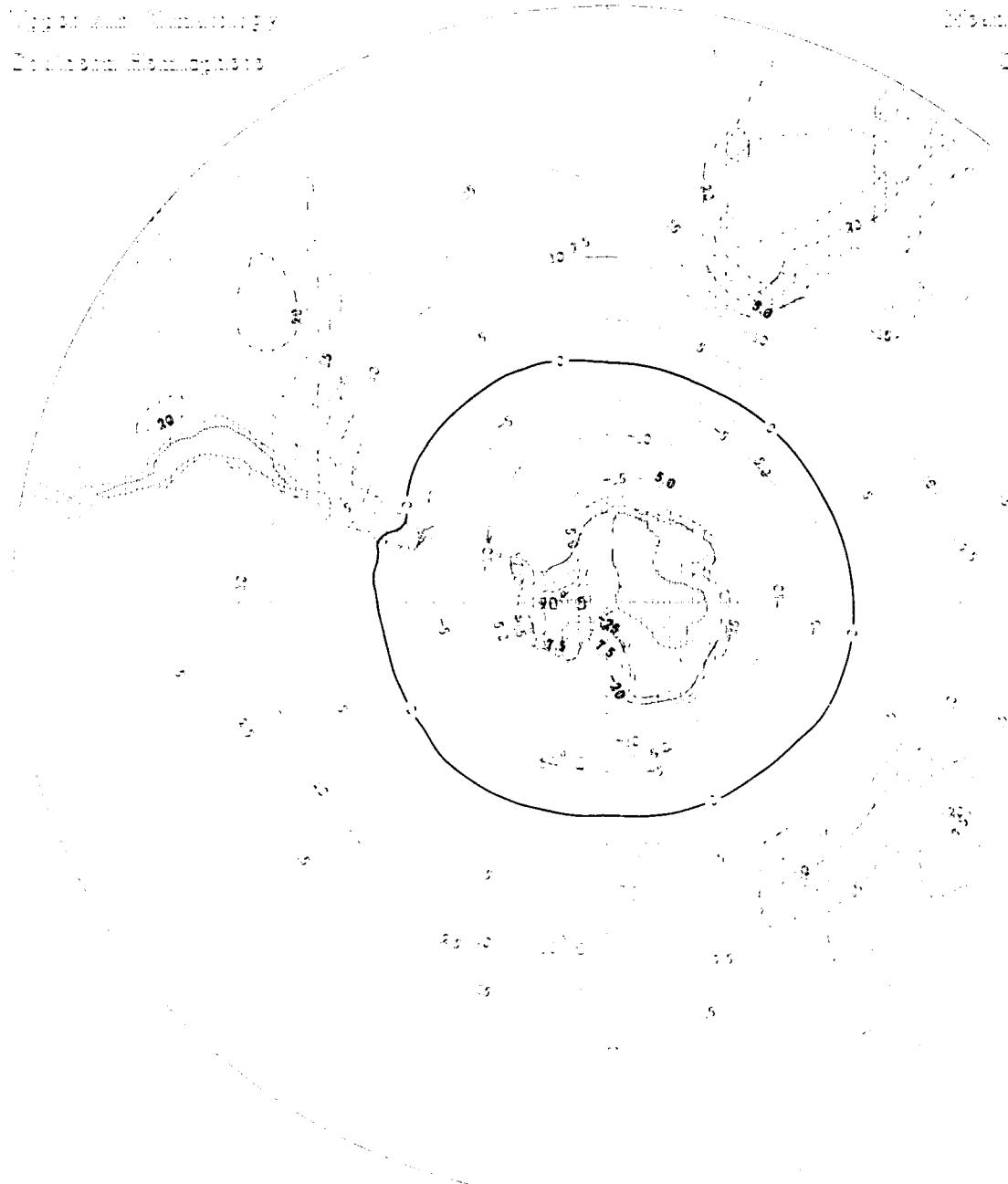
Fig. 23. Wind Distribution
Bogotá, Colombia

Wind (Km per hour)

2000 ft. (600 m.)

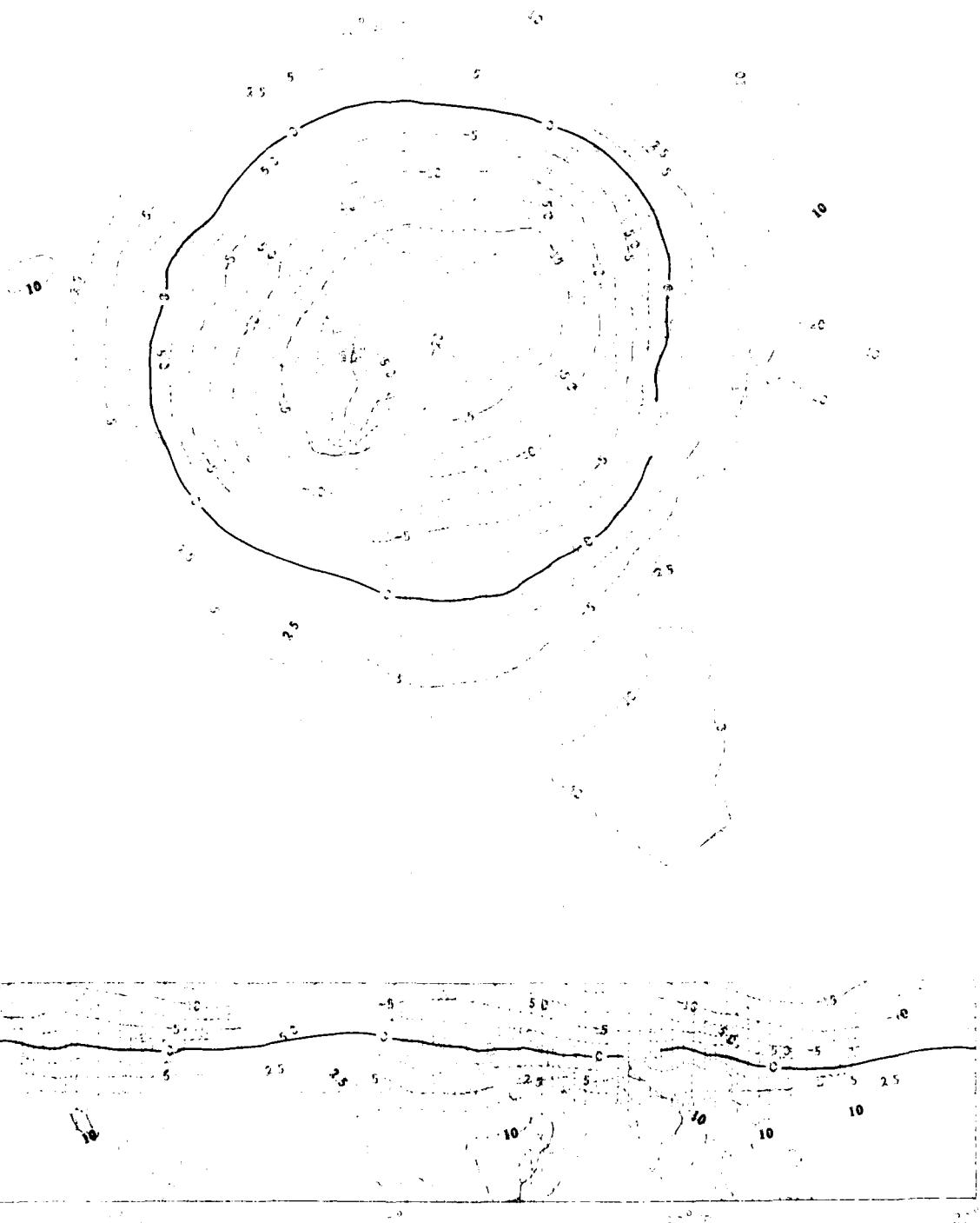
1000 ft.

500 ft.



Mean Wind Direction (°)
Wind Speed (m sec⁻¹)

Wind and Currents
Mediterranean



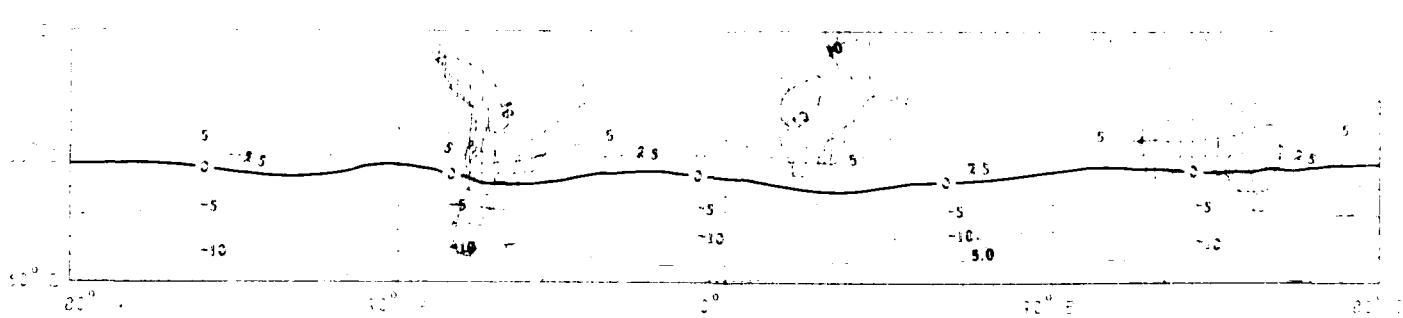
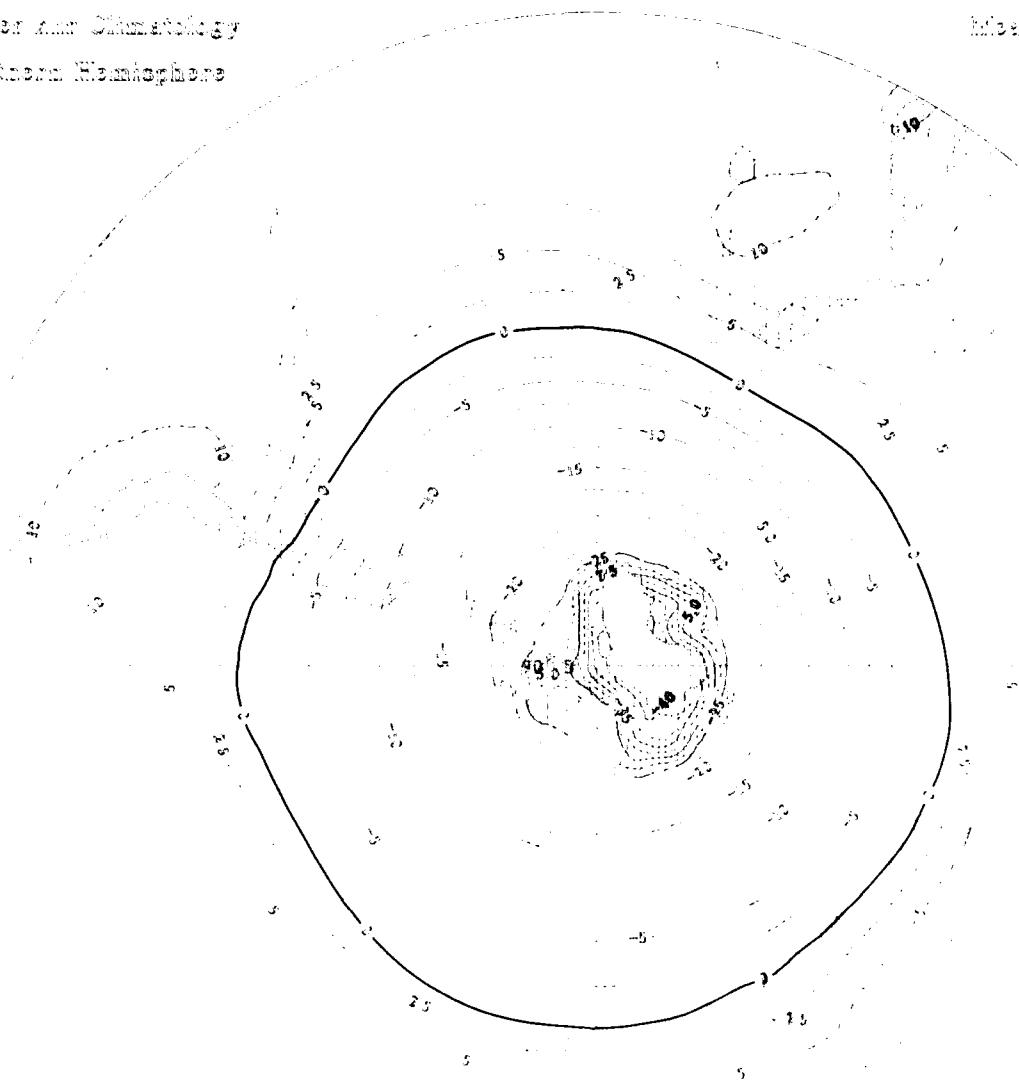
Upper Air Circulation
Northern Hemisphere

Mean Velocity (m)

2000 ft G.P.T.

Velocity

Velocity



Robert Young Collection (C)

East Asia Collection

Copy of map from
National Maritime Commission

China

1: 10,000,000

-5

-5

25° N.

2

2

2

2

2

2

2

2

20

20

20

20

20

20

20

20

20

20

20

20

20

20

20

20

25

25

25

25

25

25

25

25

25

25

25

25

25

25

30

30

30

30

30

30

30

30

30

30

30

30

30

30

35

35

35

35

35

35

35

35

35

35

35

35

35

35

40

40

40

40

40

40

40

40

40

40

40

40

40

40

45

45

45

45

45

45

45

45

45

45

45

45

45

45

50

50

50

50

50

50

50

50

50

50

50

50

50

50

55

55

55

55

55

55

55

55

55

55

55

55

55

55

60

60

60

60

60

60

60

60

60

60

60

60

60

60

65

65

65

65

65

65

65

65

65

65

65

65

65

65

70

70

70

70

70

70

70

70

70

70

70

70

70

70

75

75

75

75

75

75

75

75

75

75

75

75

75

75

80

80

80

80

80

80

80

80

80

80

80

80

80

80

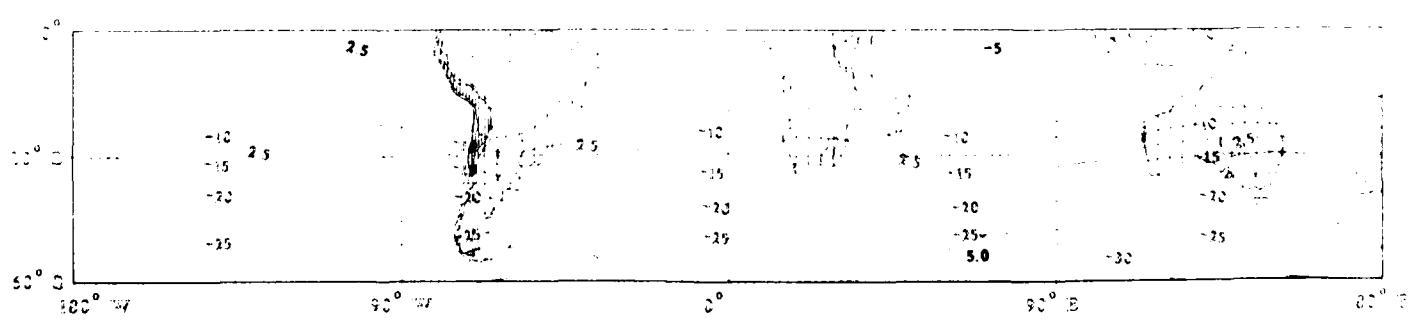
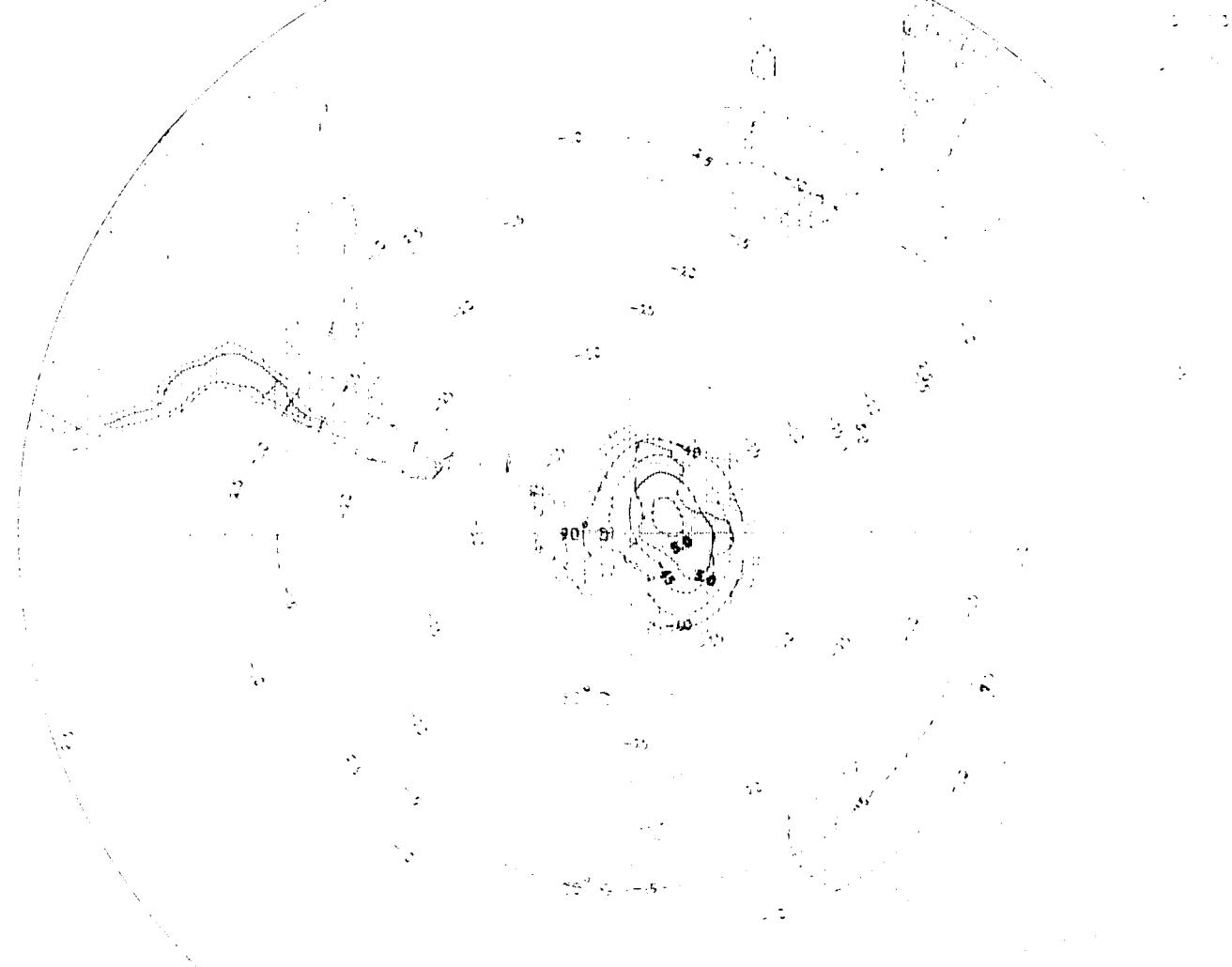


Upper air circulation

Model solution (100)

Latitude (degrees)

Longitude (degrees)



Region and Amplitude

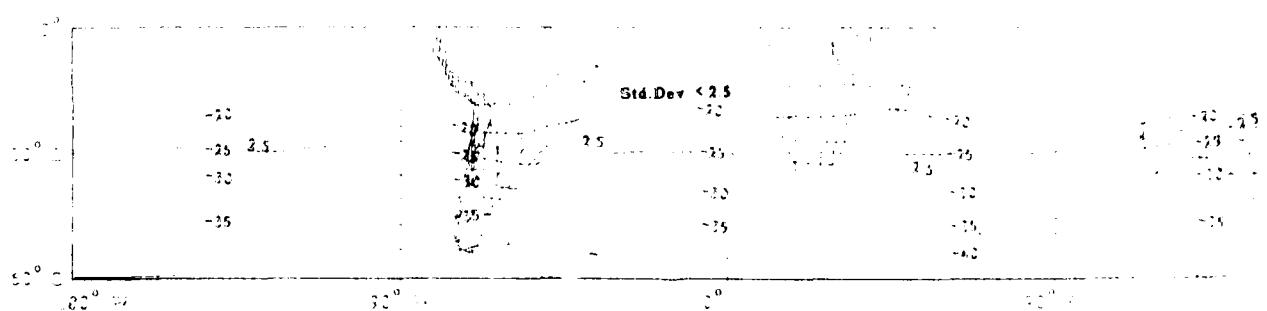
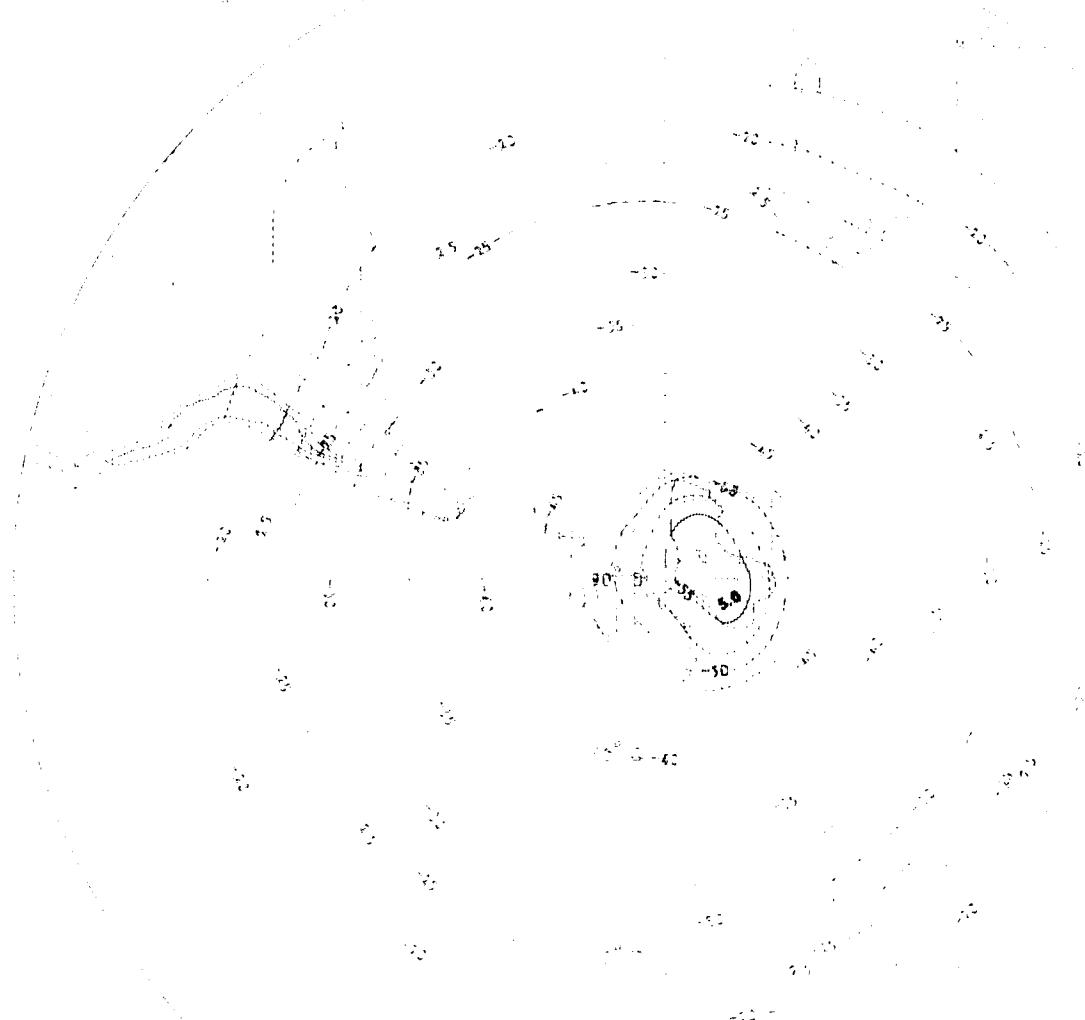
Sampling Number 1213

Model Temperature (C)

2000 Metres (C)

0.00

-0.05



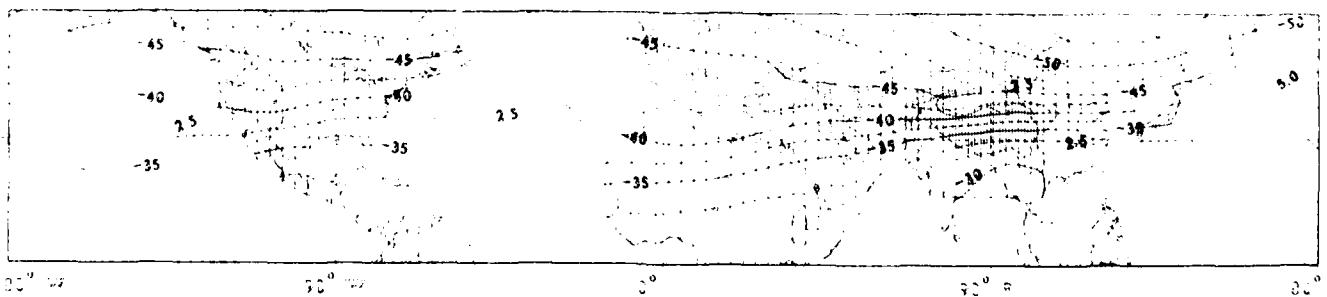
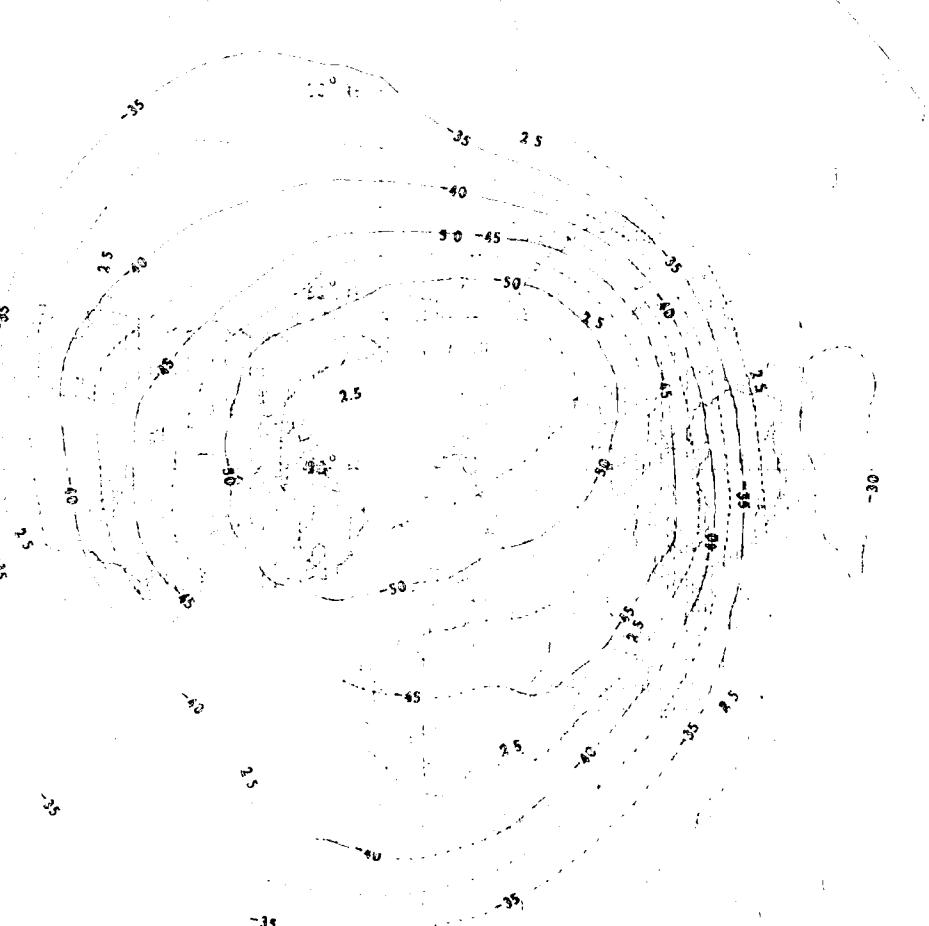
Mean Temperature (°C)

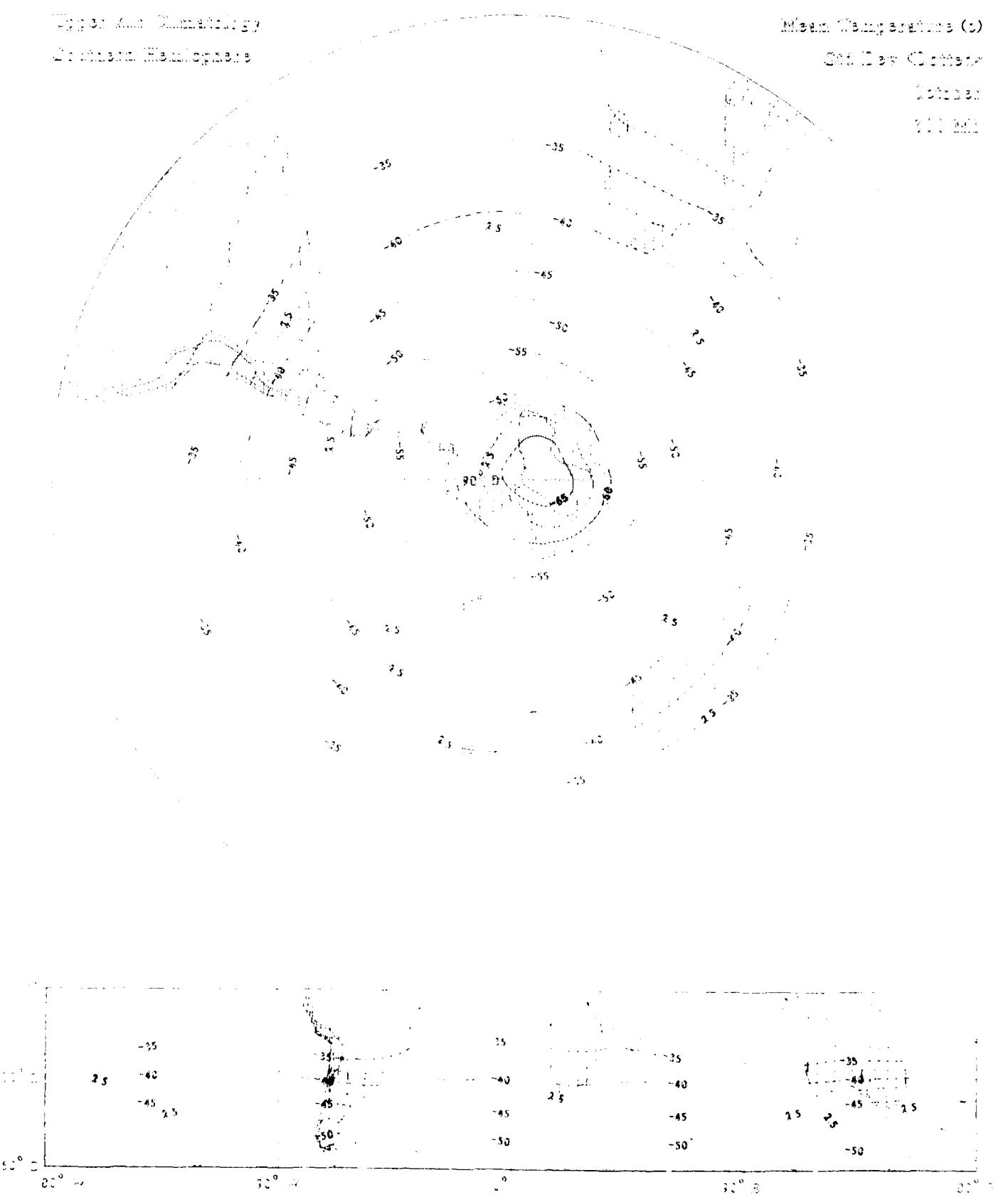
Std Dev < Dotted >

October

100 MB

Upper Air Climatology
Northern Hemisphere





Mean Temperature (C)

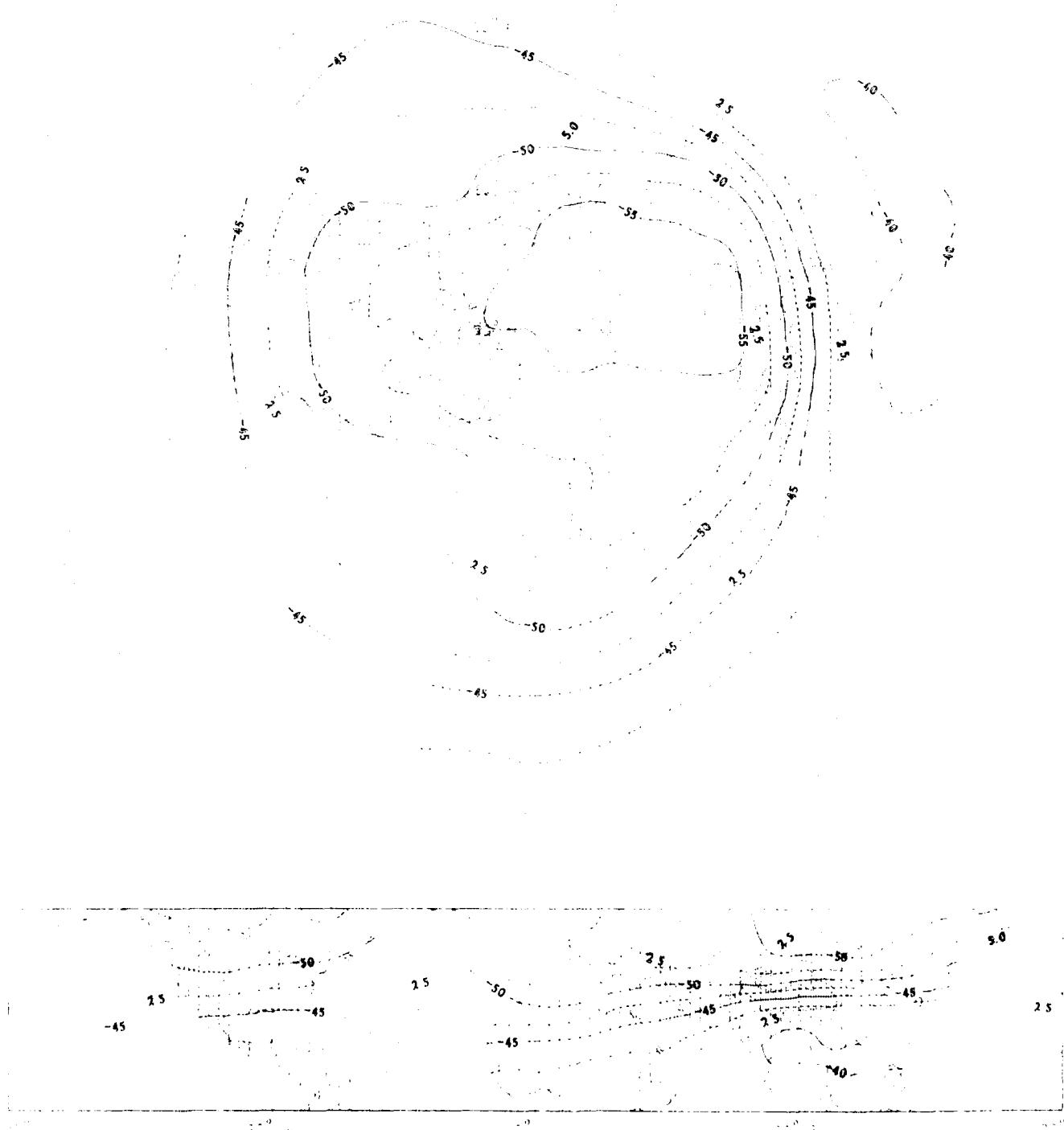
Std Dev <Deleted>

卷之三

卷之三

Upper Air Climatology

Northern Hemisphere



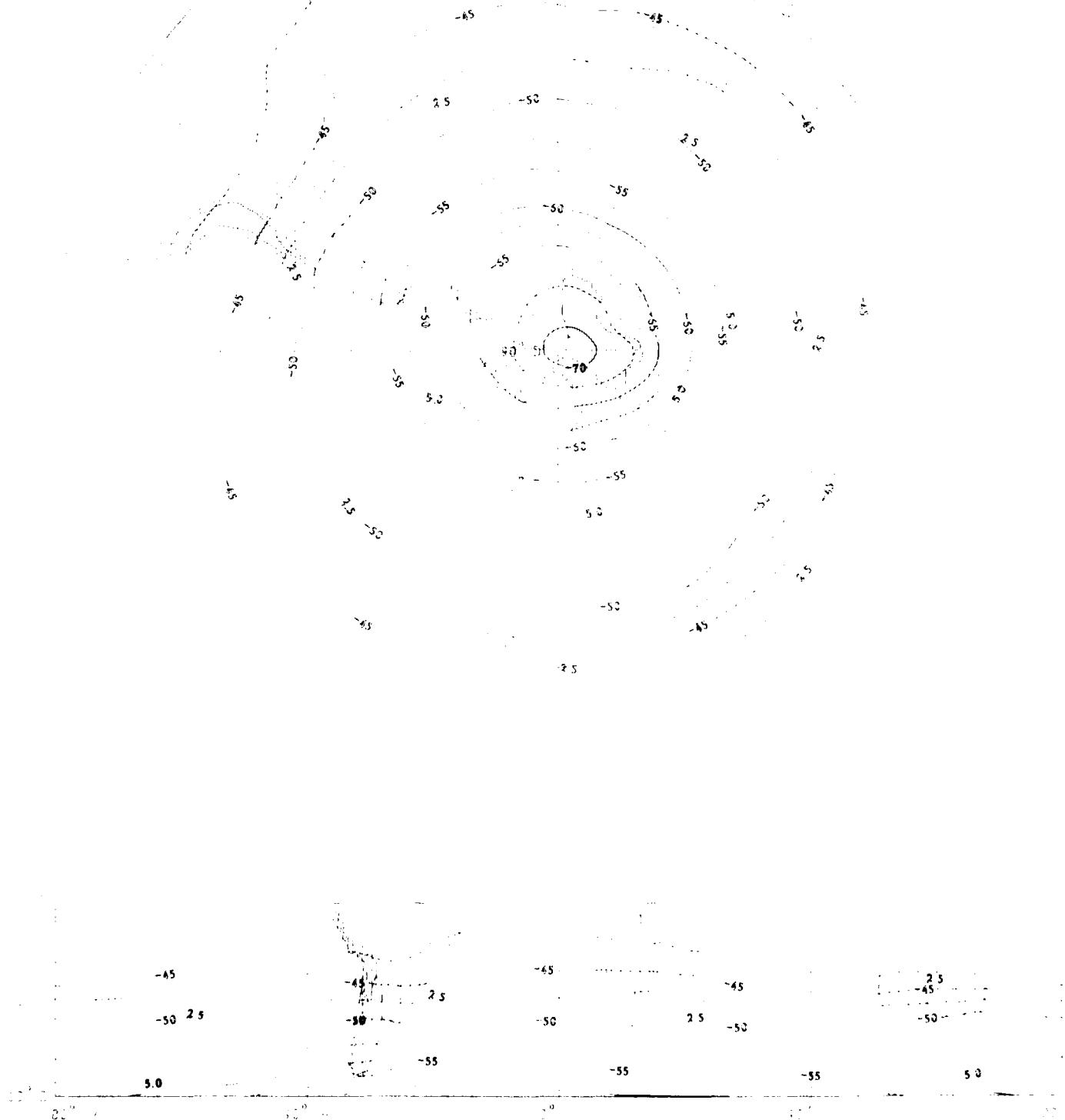
Types and Climatology
Northern Hemisphere

Mean Temperature (°)

Oct Nov Dec

25° 20° 15°

25° 20° 15°



Mean Temperature (°)

20.0 ± 0.0 (19.8)

± 0.0 (3.0)

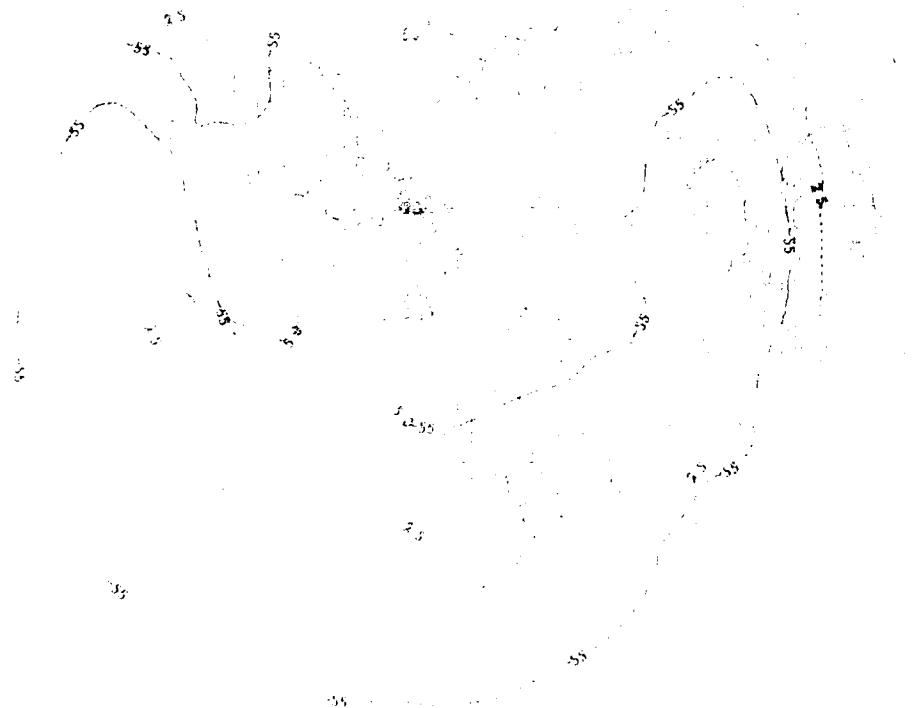
± 0.0 (3.0)

Fig. 3. Mean Temperature (°)

Standard Deviations

28

28



Topographic Survey

Concord, New Hampshire 1816

Sheet No. 10 (of 10)

Scale 1 mile to 1 inch

1 mile

1/2 mile



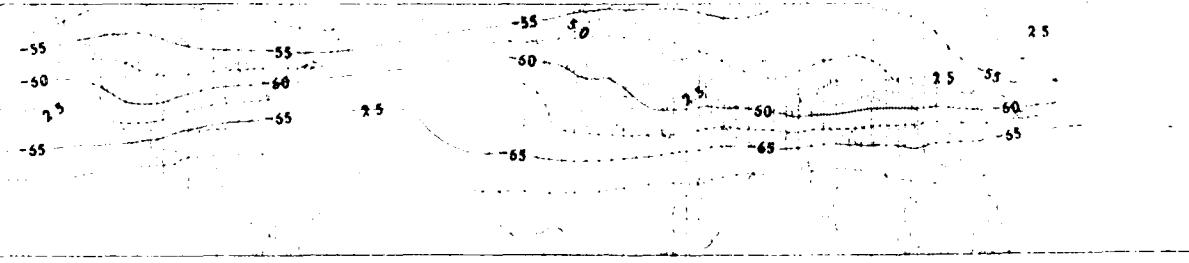
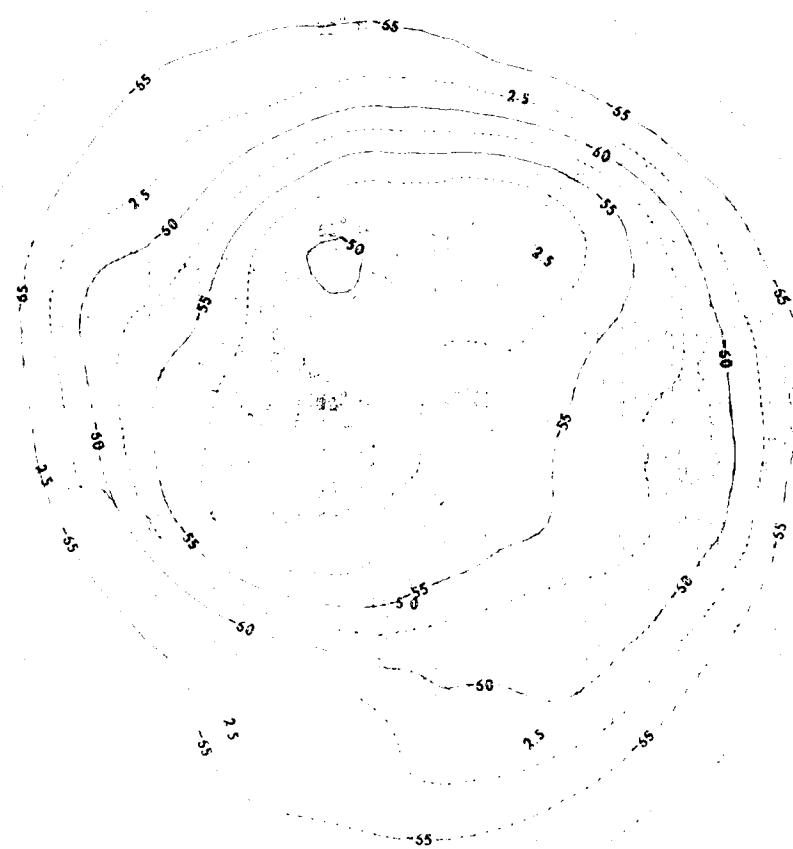
Mean Temperature (°C)

Std Dev < Dotted >

October

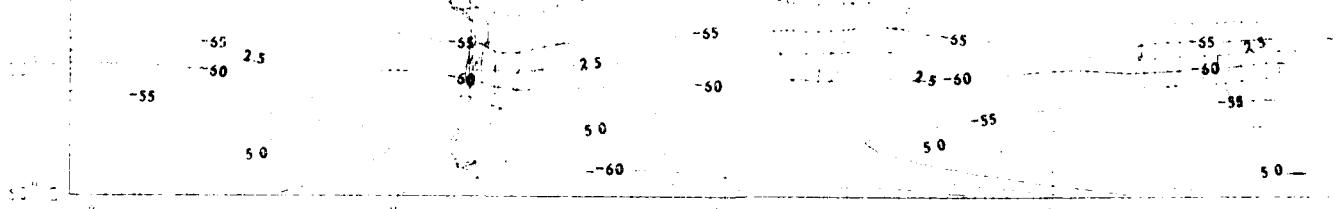
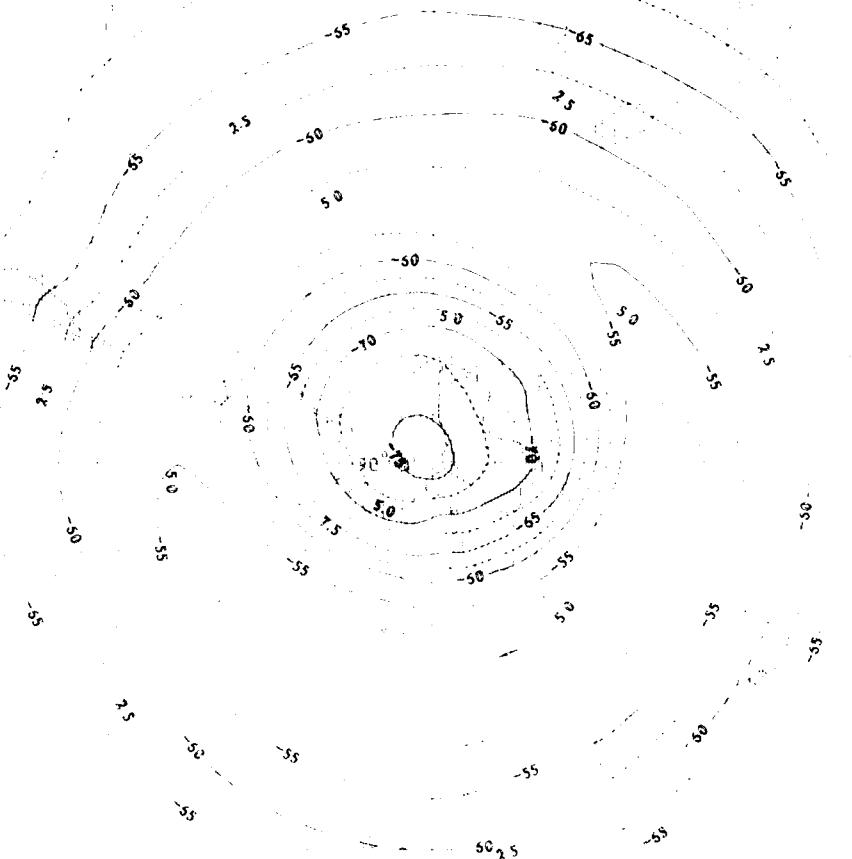
150 Mb

Upper Air Climatology
Northern Hemisphere



Geophysical Meteorology
Northern Hemisphere

Mean Temperature (°C)
Std Dev (Dotted)
October
150 MB



Mean Temperature (°)

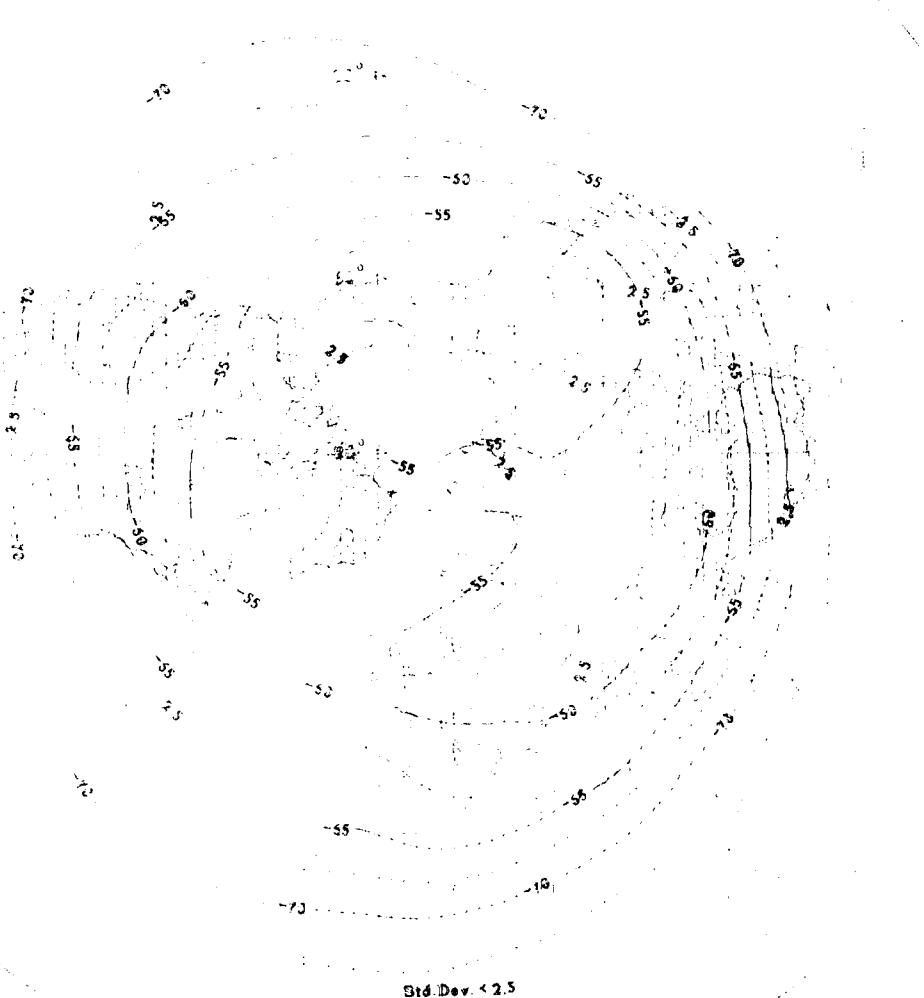
Std Dev (Coffield)

1000 mb

500 mb

Upper Air Climatology

Northern Hemisphere



Std Dev. < 2.5

Std Dev. < 2.5

Upper and Lower Layer

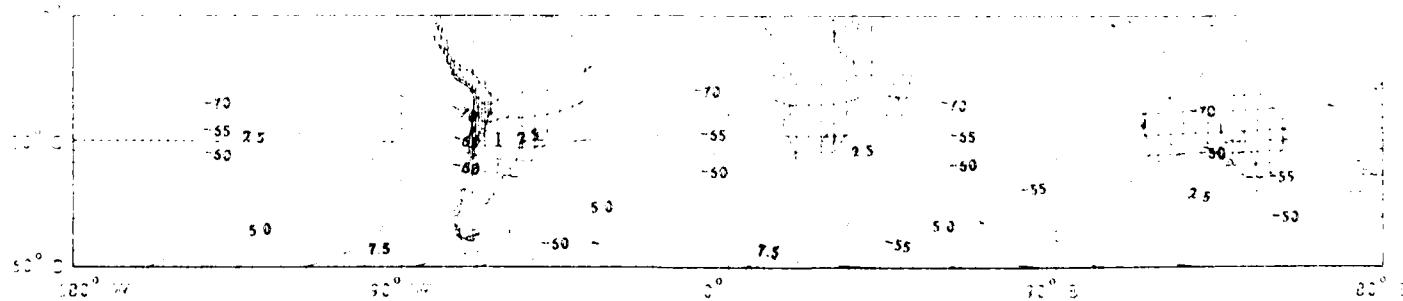
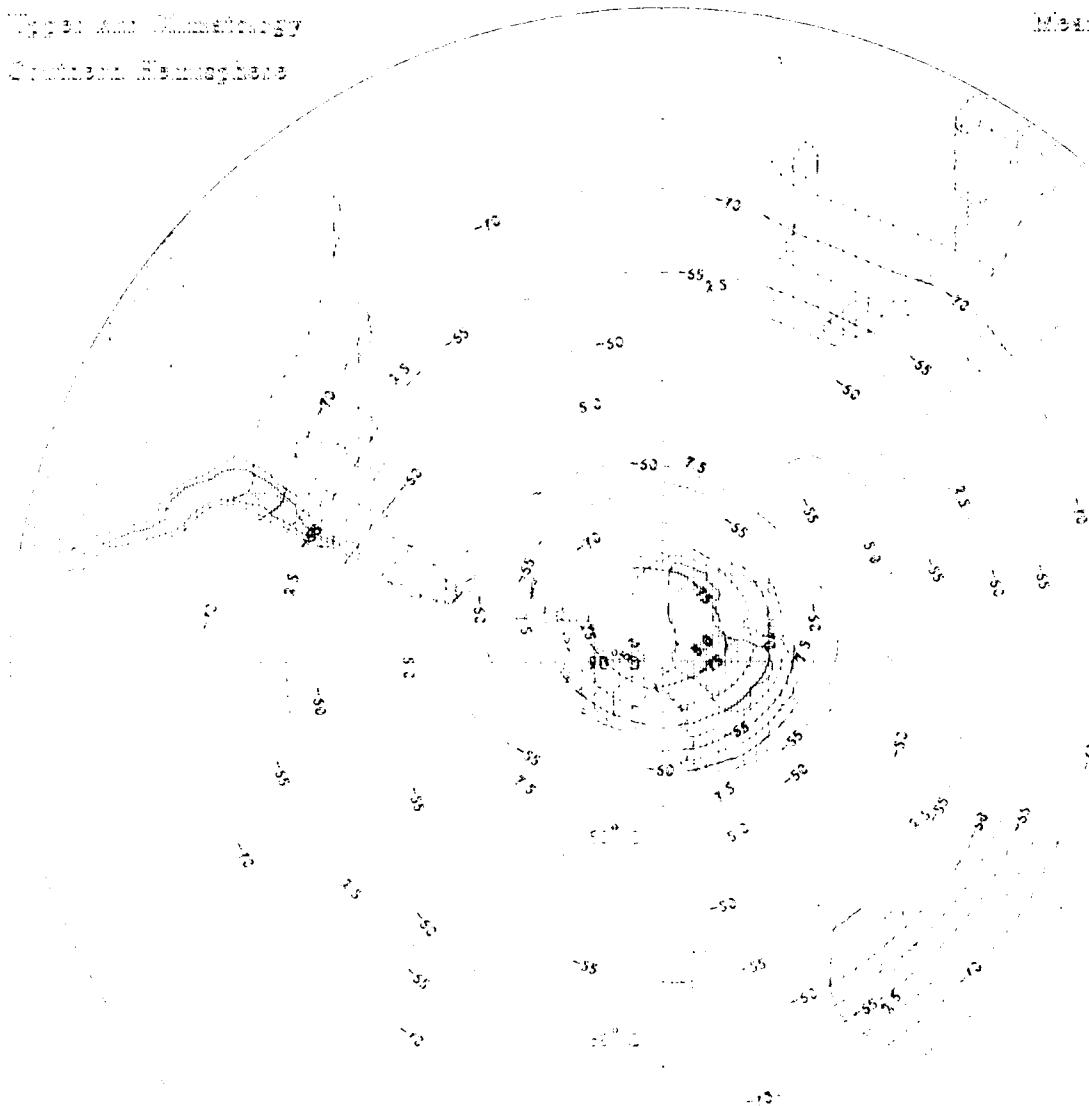
Conducting Medium

Mean Temperature (°)

Std Dev (C)

Oct 1961

1961 Data



Mean Temperature (°)

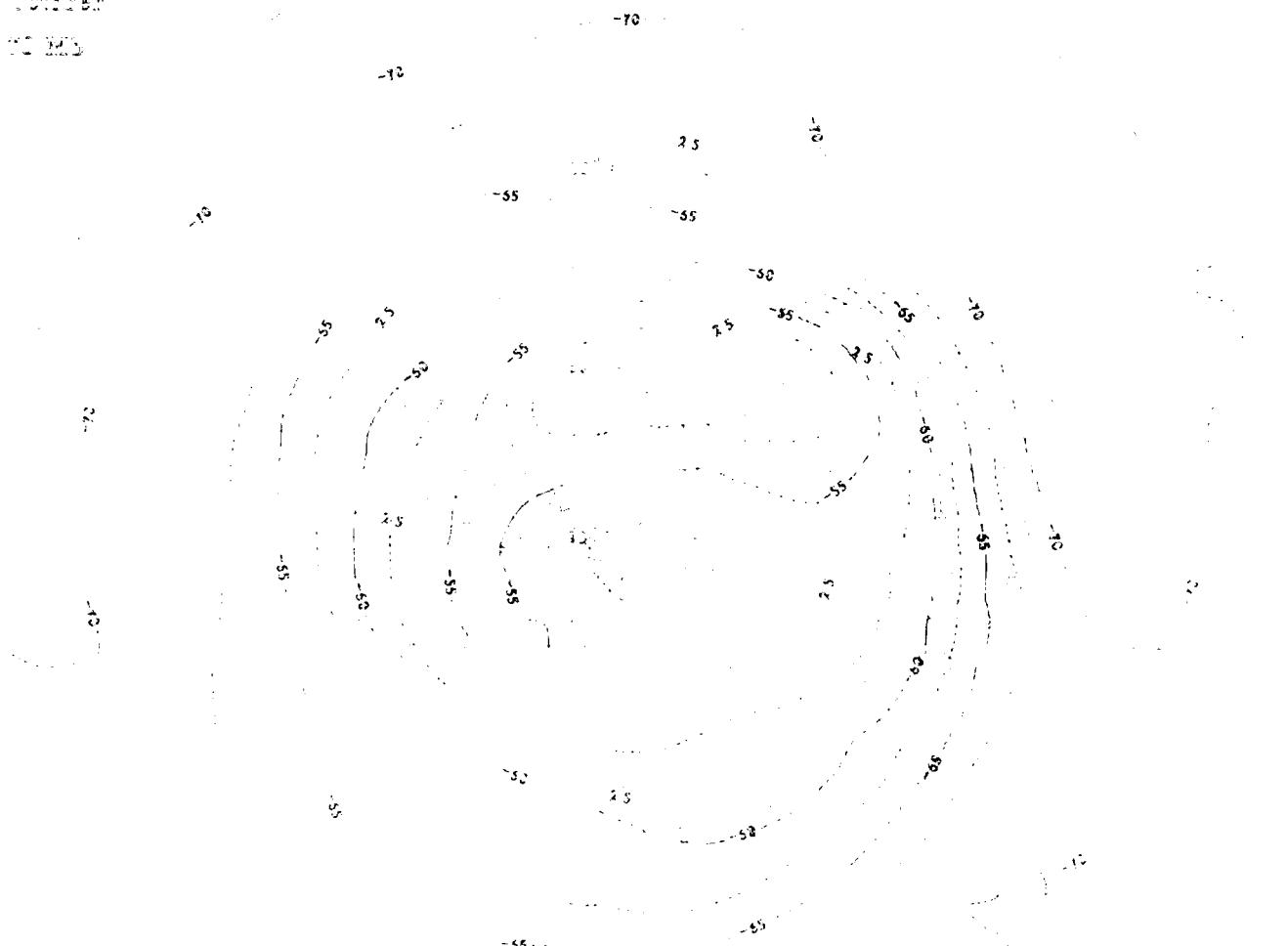
Std.Dev < 2.5

Other

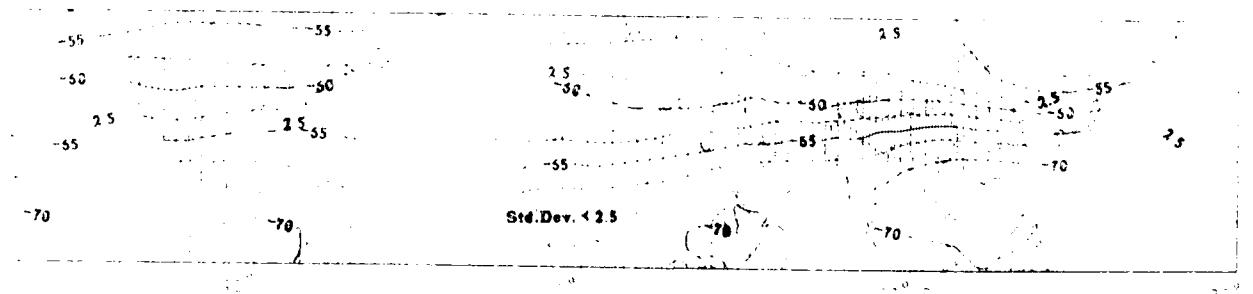
TC MD

Upper Air Climatology

Northern Hemisphere

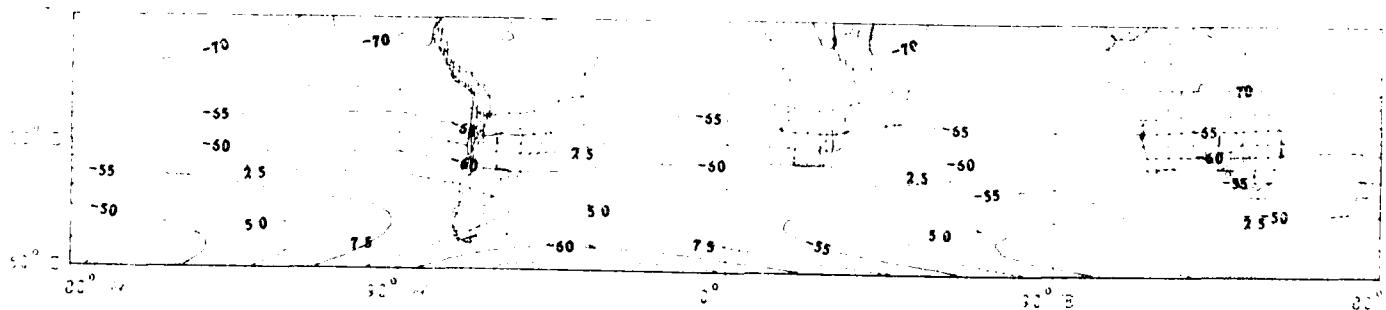
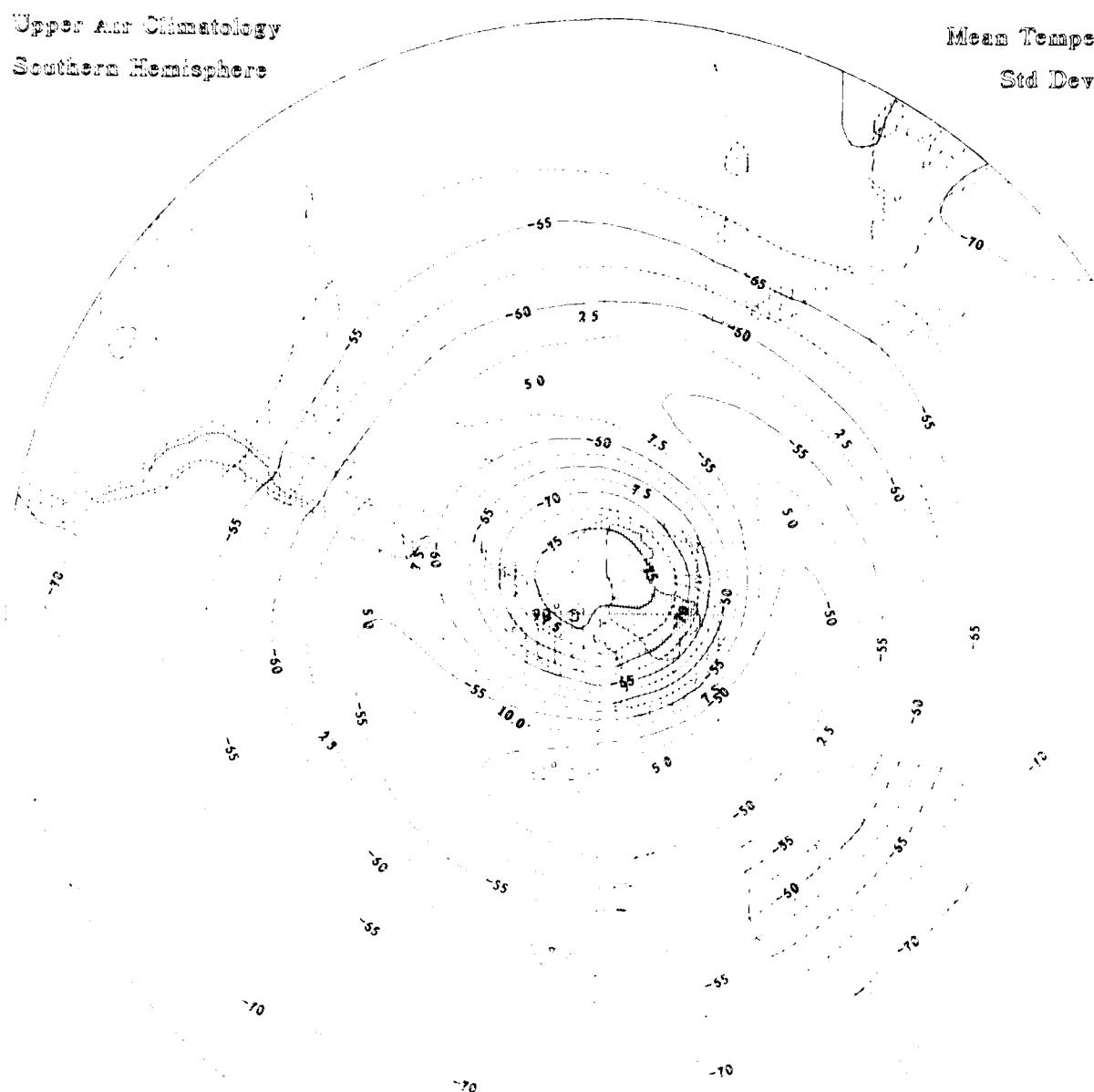


Std.Dev < 2.5



Upper Air Climatology
Southern Hemisphere

Mean Temperature (°C)
Std Dev (Dotted)
October
700 MB



Mean Temperature (°)

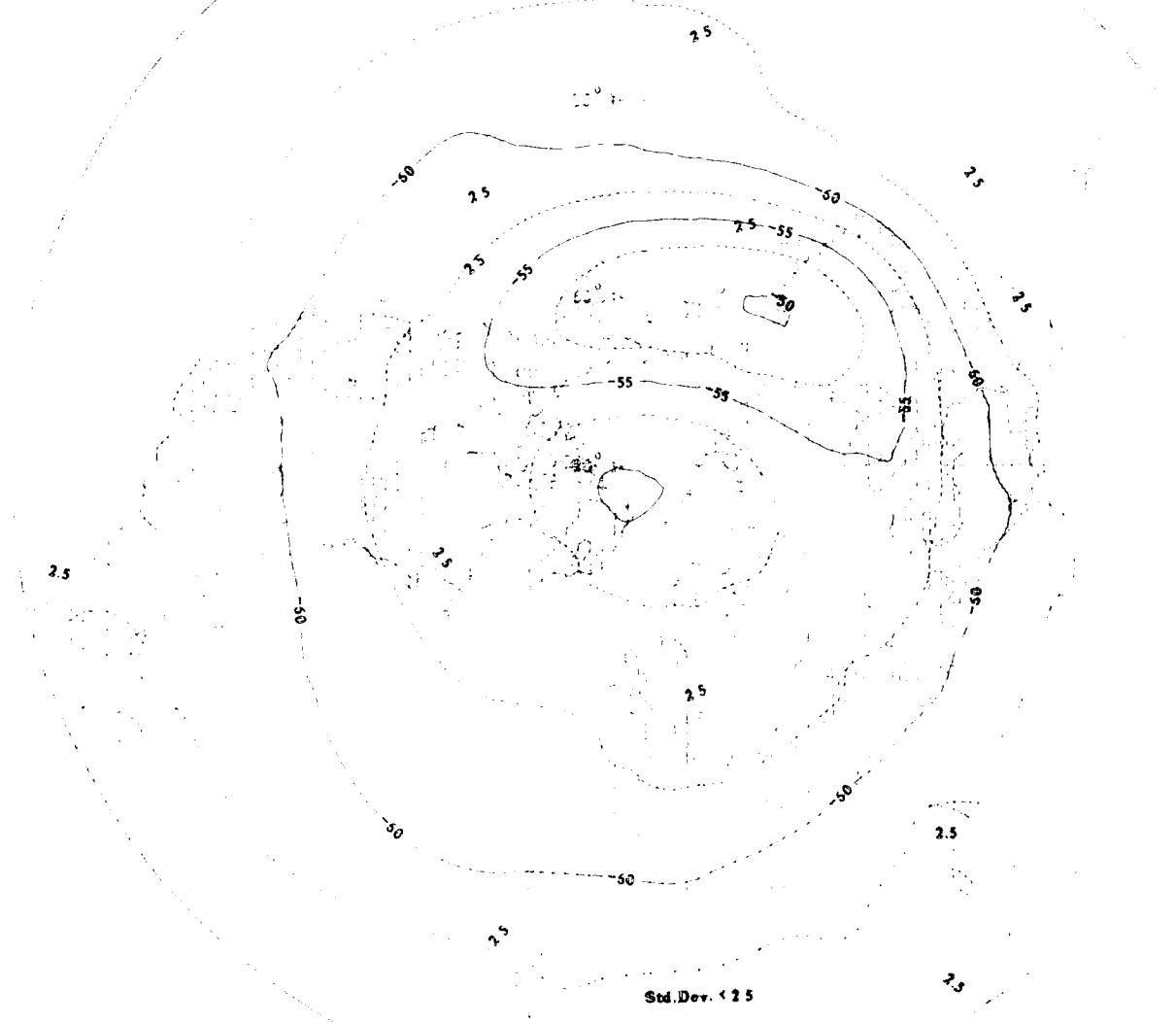
Std Dev < Dotted >

October

50 MB

Upper Air Climatology

Northern Hemisphere



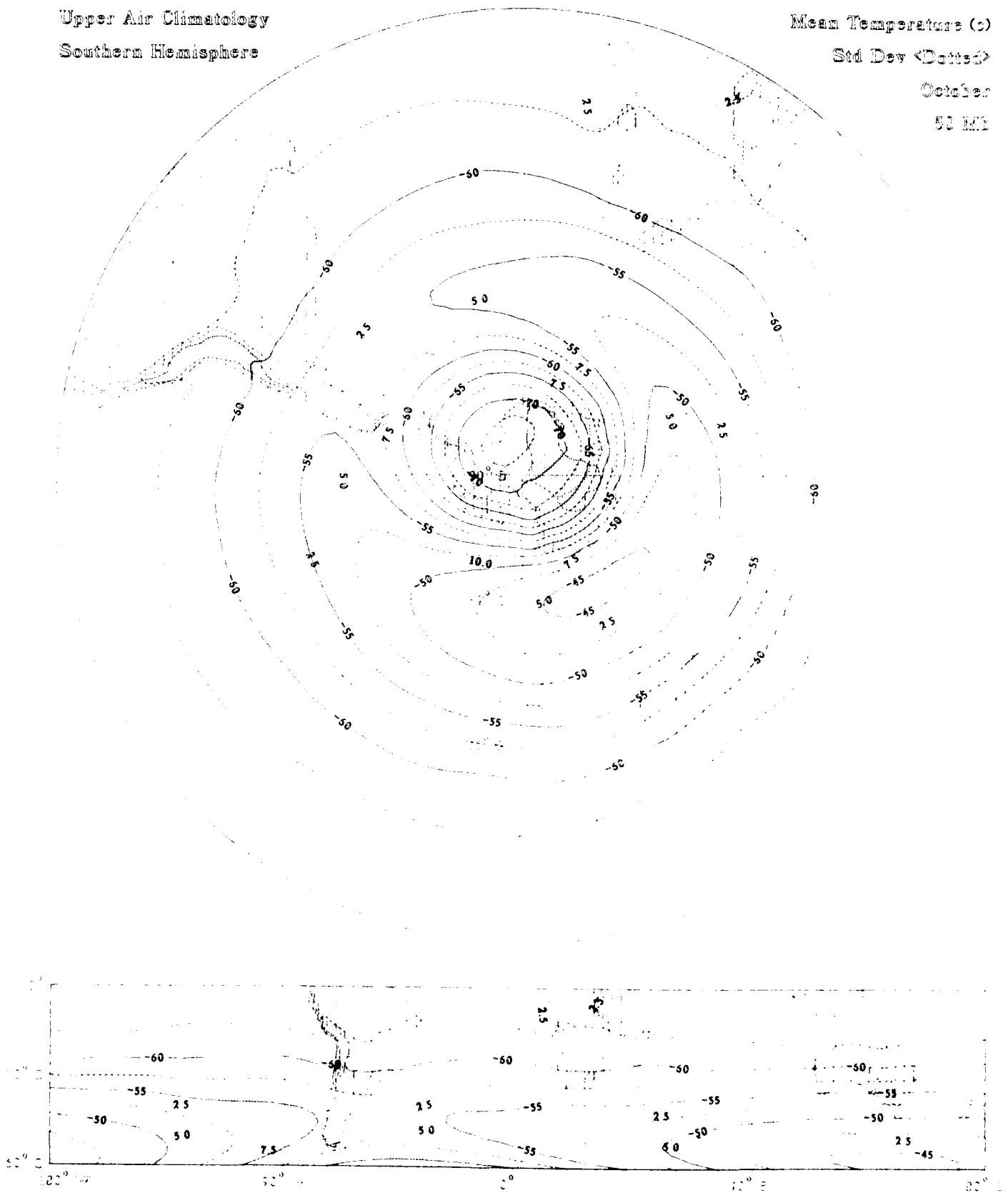
Std.Dev. < 2.5



Std.Dev. < 2.5

Upper Air Climatology
Southern Hemisphere

Mean Temperature ($^{\circ}$)
Std Dev <Dotted>
October
50 MB



Mean Temperature (°)

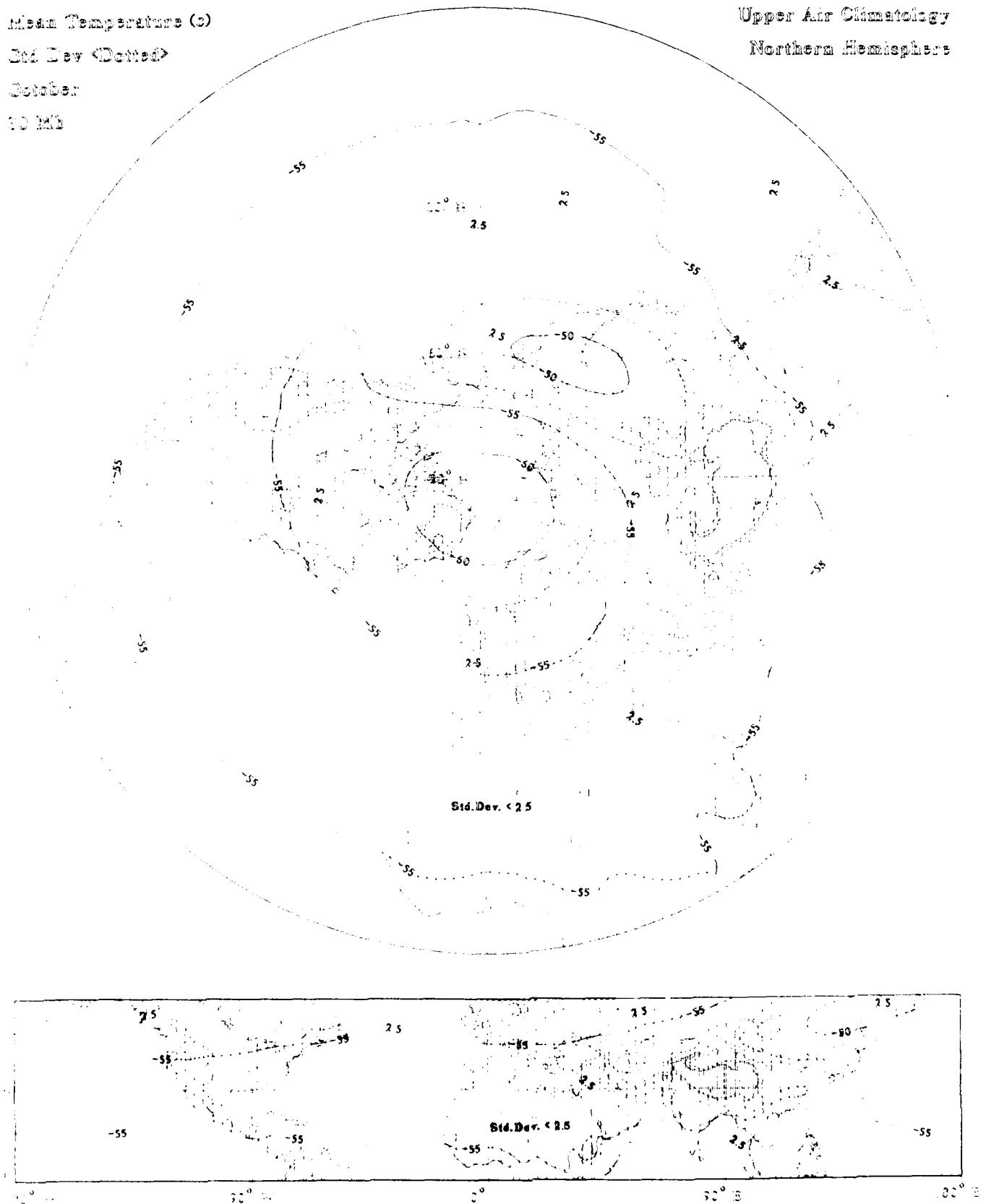
Std Dev <Dotted>

Digitized by srujanika@gmail.com

二三

Upper Air Climatology

Northern Hemisphere



Upper Air Climatology

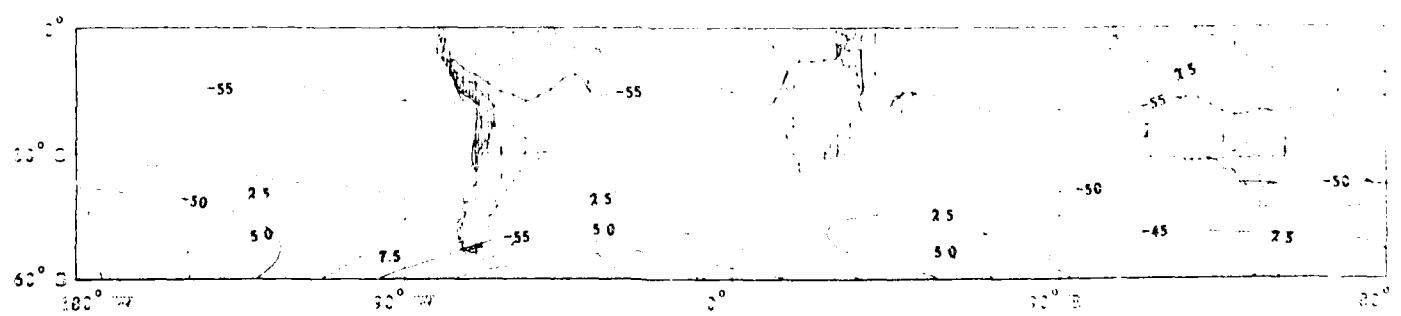
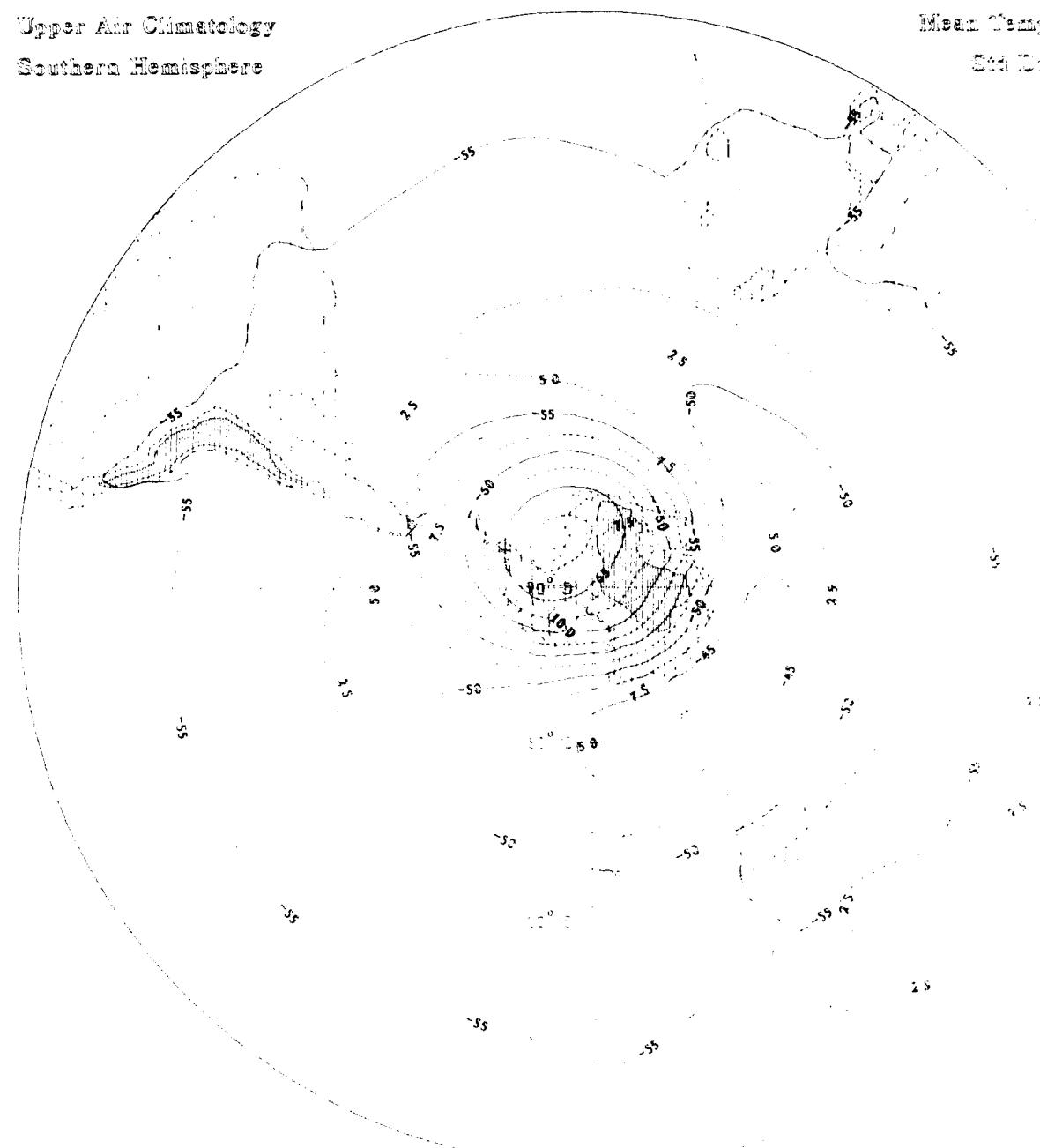
Southern Hemisphere

Mean Temperature (°)

Std Dev (C)

Correlation

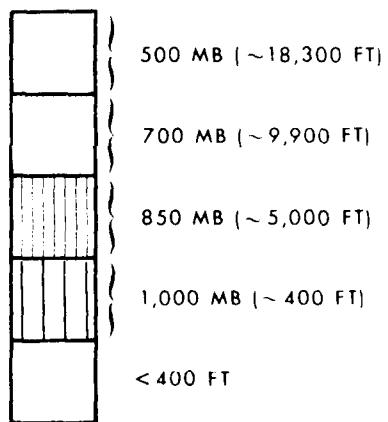
W.H. Bratt



DEW POINT
(6 LEVELS, 1000 TO 300 MB)

- Contours of mean dew point (solid and dashed lines) in °C; solids labeled, dashed intermediates unlabeled.
- Dew point labeled interval: 5°C
- Contours of standard deviation of dew point (dotted lines) in °C
- Standard deviation of dew point labeled interval: 2.5°C
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE



Mean Dew Point (c)

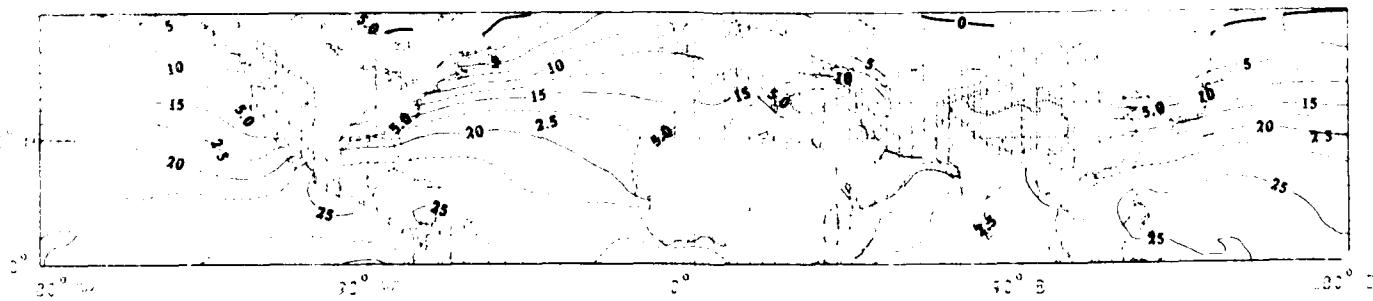
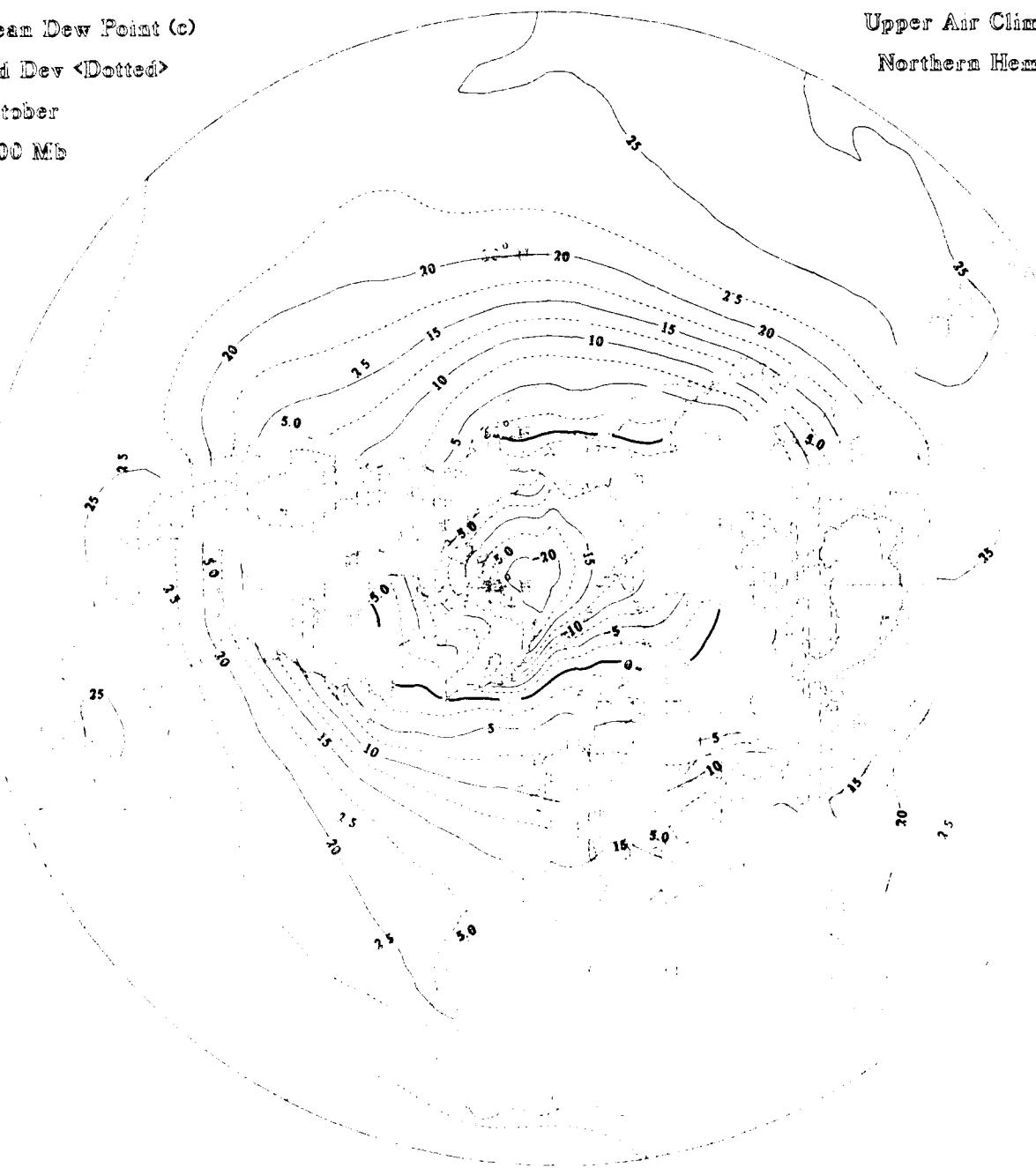
Std Dev < Dotted >

October

1000 Mb

Upper Air Climatology

Northern Hemisphere



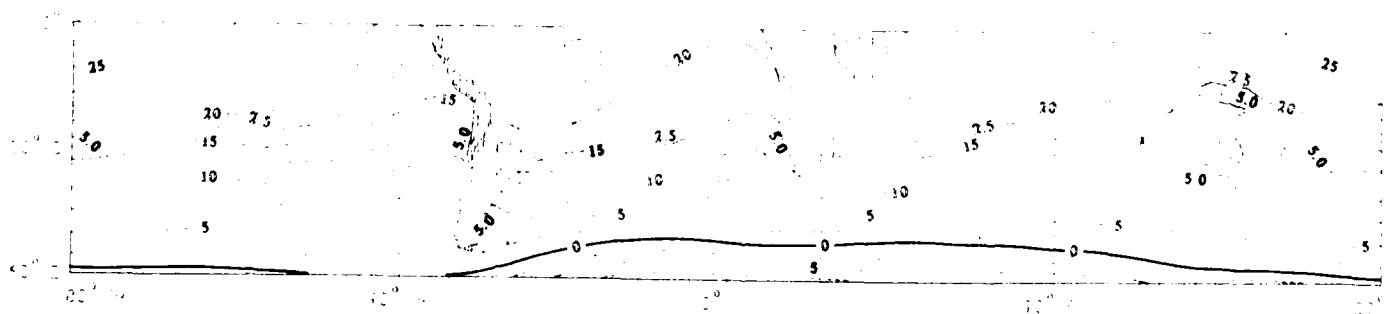
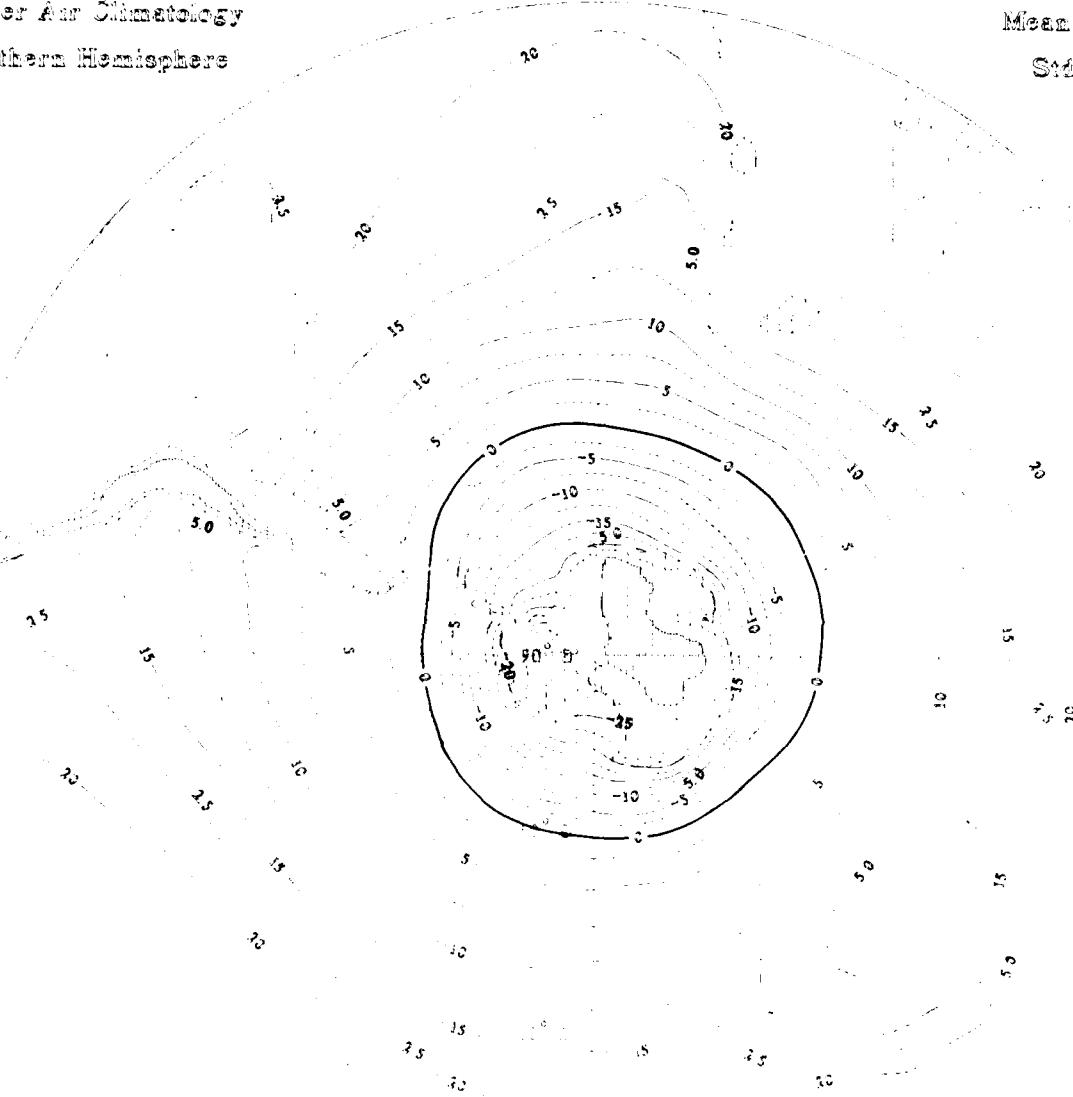
Upper Air Climatology Southern Hemisphere

Mean Dew Point (°)

Std Dev <0.0000>

३८५

2233 3472



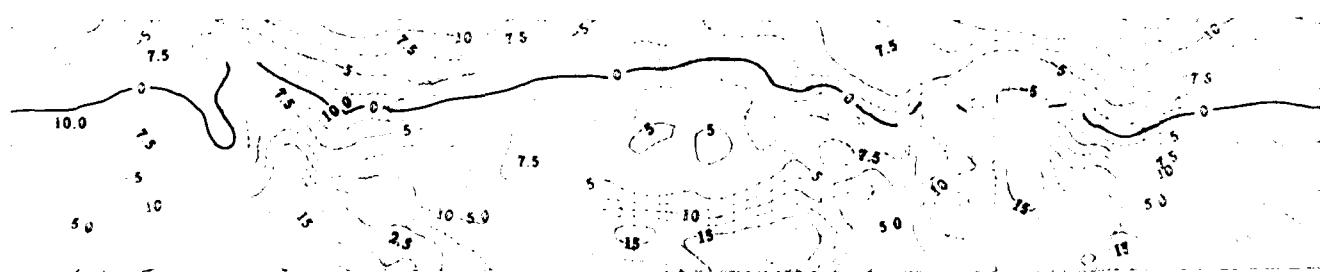
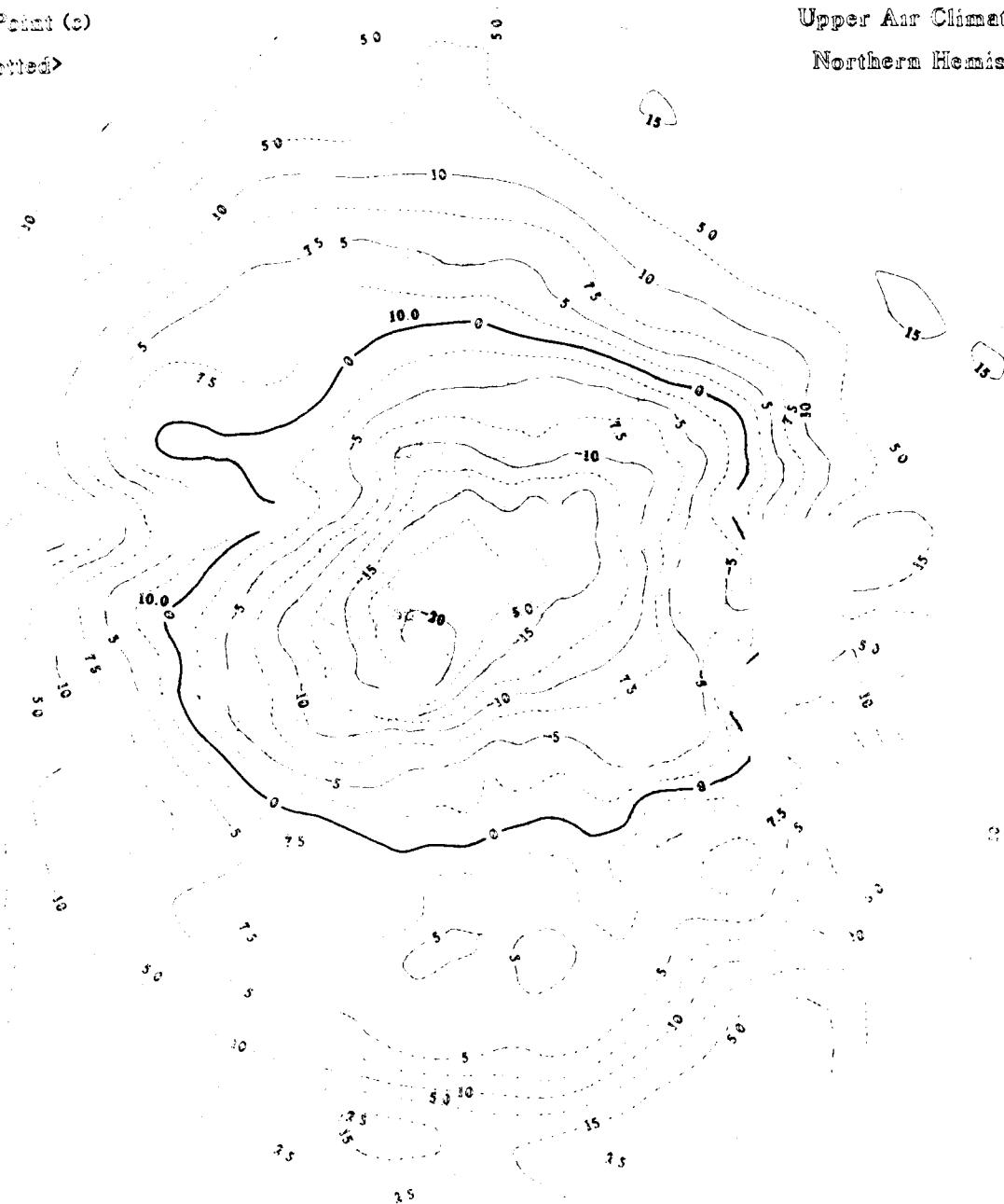
Mean Dew Point (°C)

Std Dev (Dotted)

October

300 MB

Upper Air Climatology
Northern Hemisphere



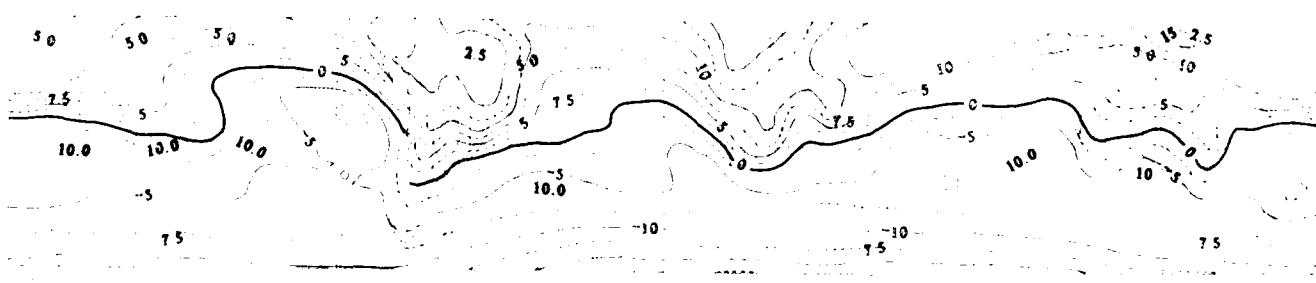
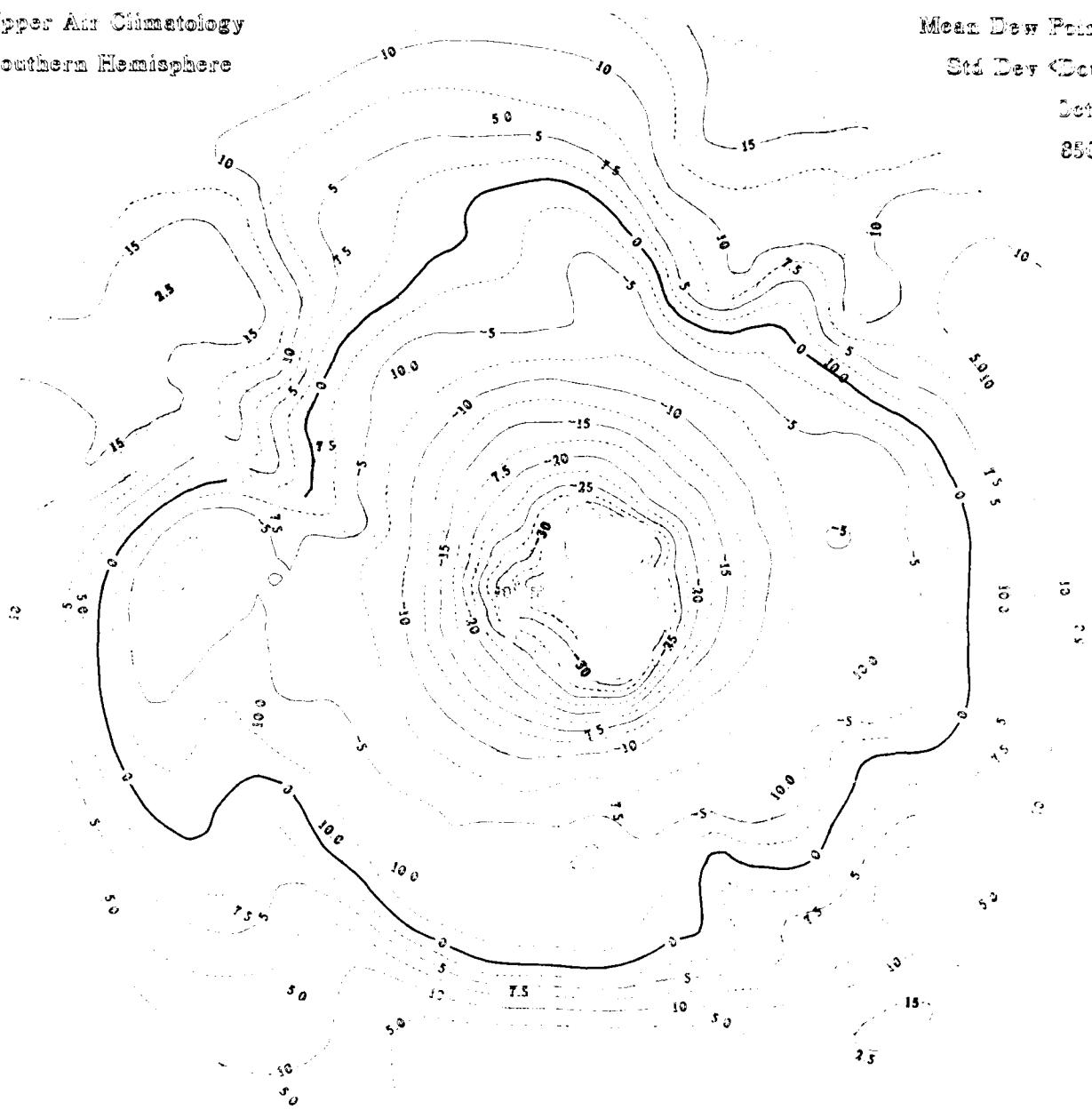
Upper Air Climatology
Southern Hemisphere

Mean Dew Point (°C)

Std Dev (Dotted)

October

850 MB



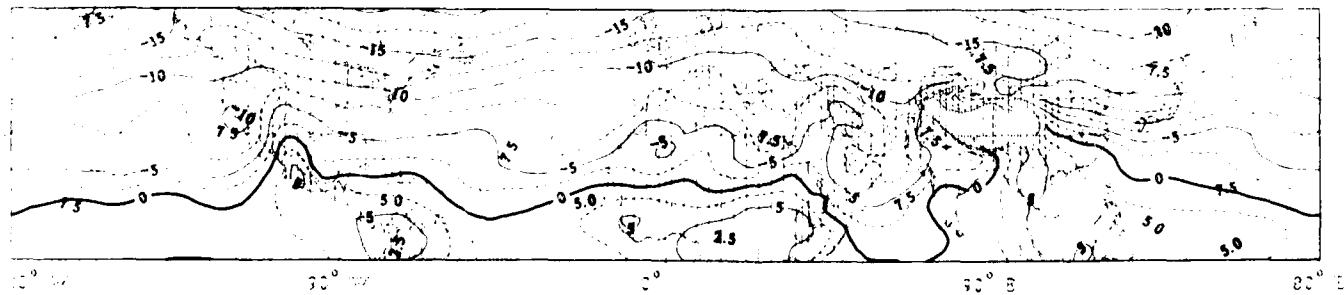
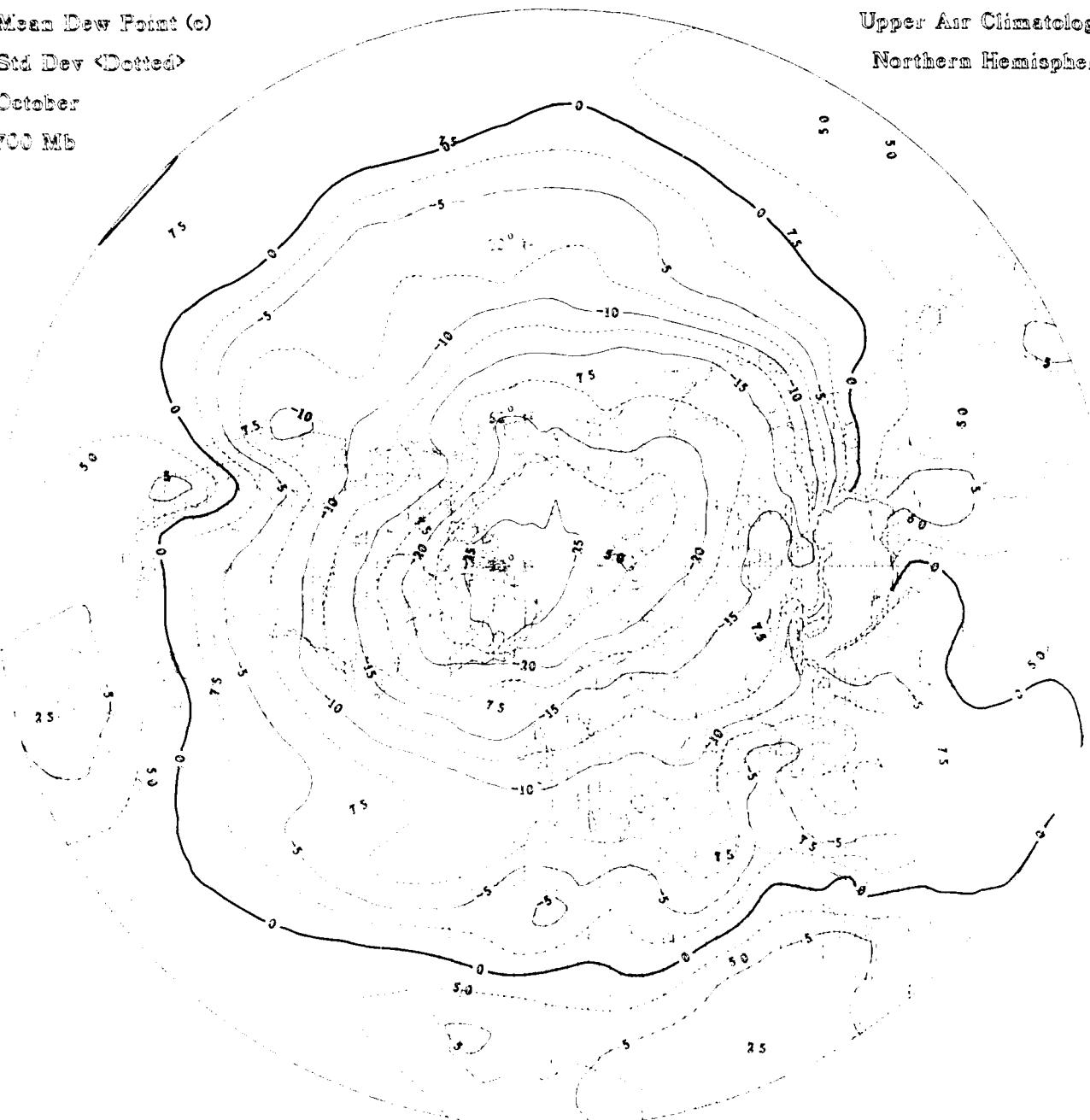
Mean Dew Point (c)

Std Dev < Dotted >

October

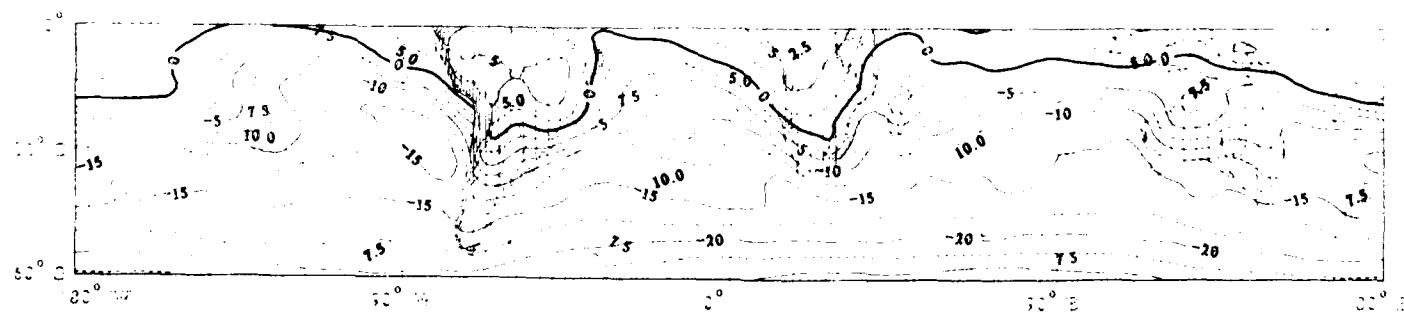
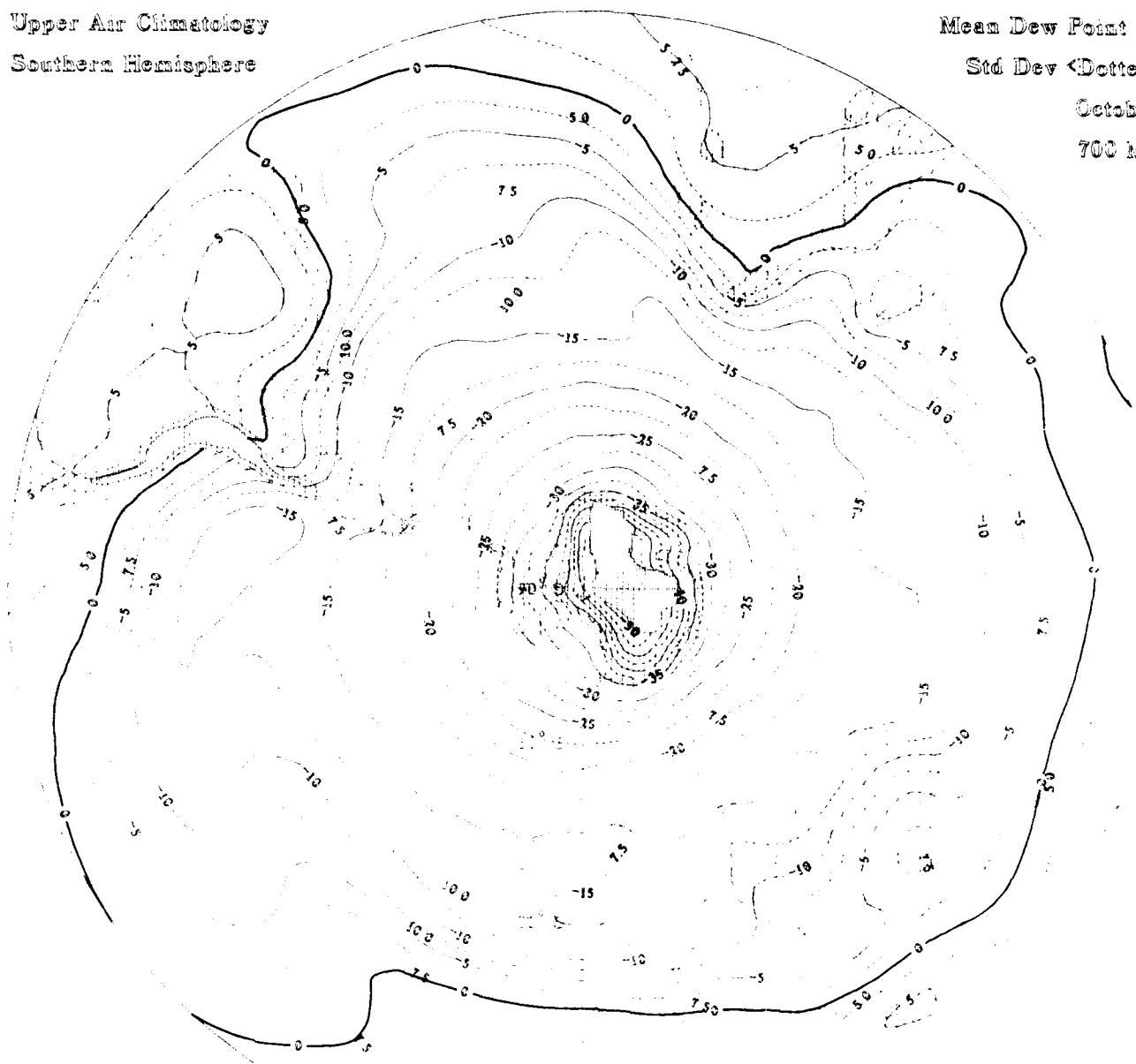
700 Mb

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Dew Point (°C)
Std Dev < Dotted >
October
700 Mb



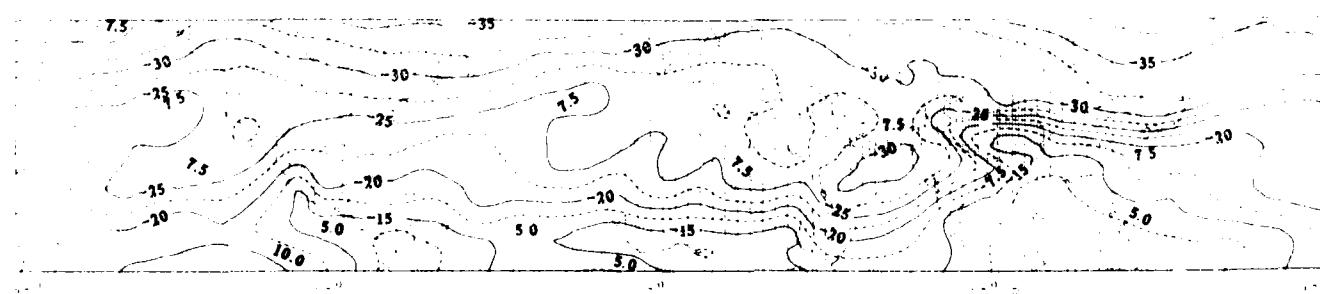
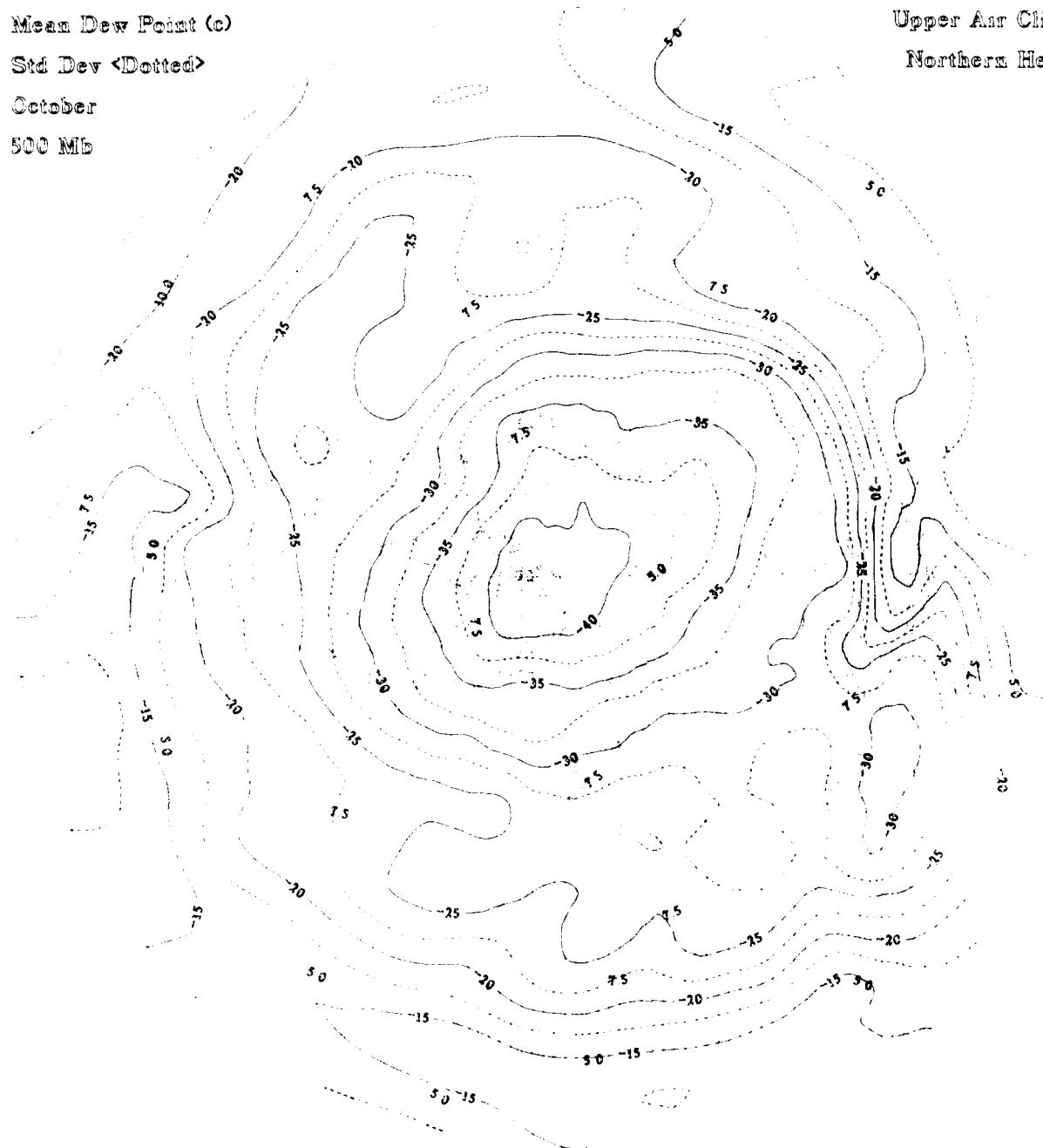
Mean Dew Point (c)

Std Dev <Dotted>

October

500 Mb

Upper Air Climatology Northern Hemisphere



Upper Air Climatology

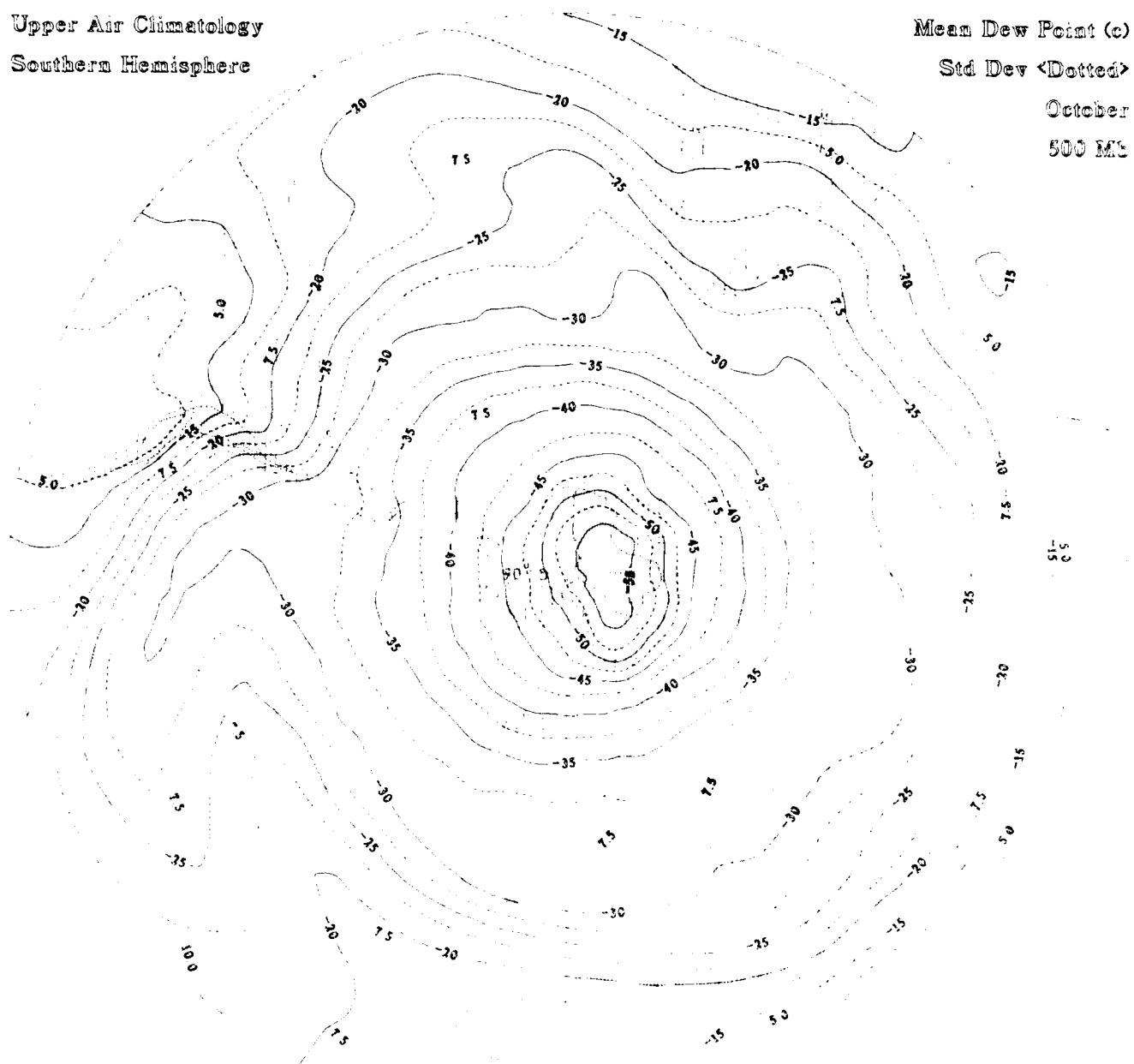
Southern Hemisphere

Mean Dew Point (c)

Std Dev < Dotted >

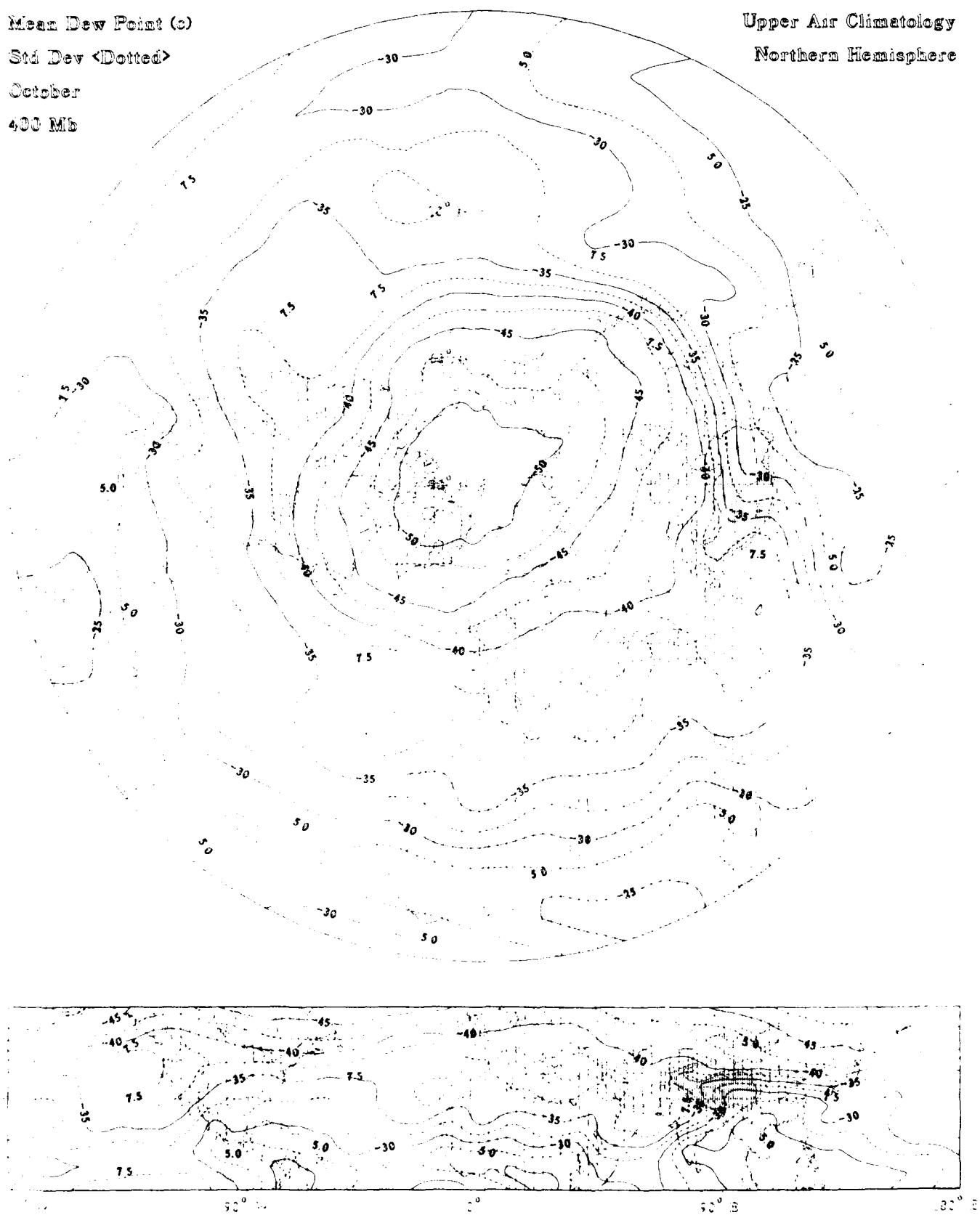
October

500 MB



Mean Dew Point (°c)
Std Dev < Dotted >
October
400 Mb

Upper Air Climatology
Northern Hemisphere



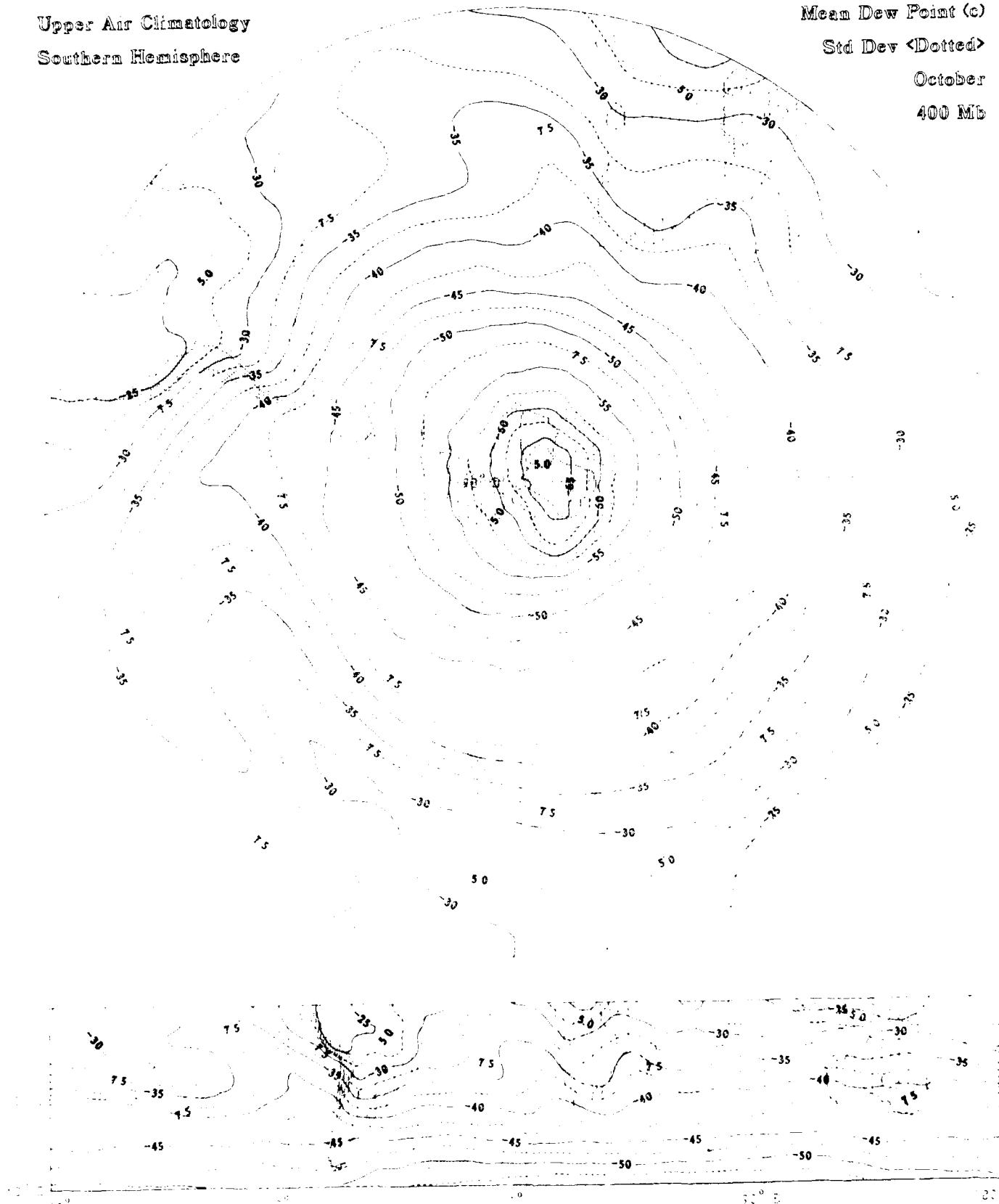
Upper Air Climatology
Southern Hemisphere

Mean Dew Point (c)

Std Dev < Dotted >

October

400 Mb



Mean Zonal风速 (m)

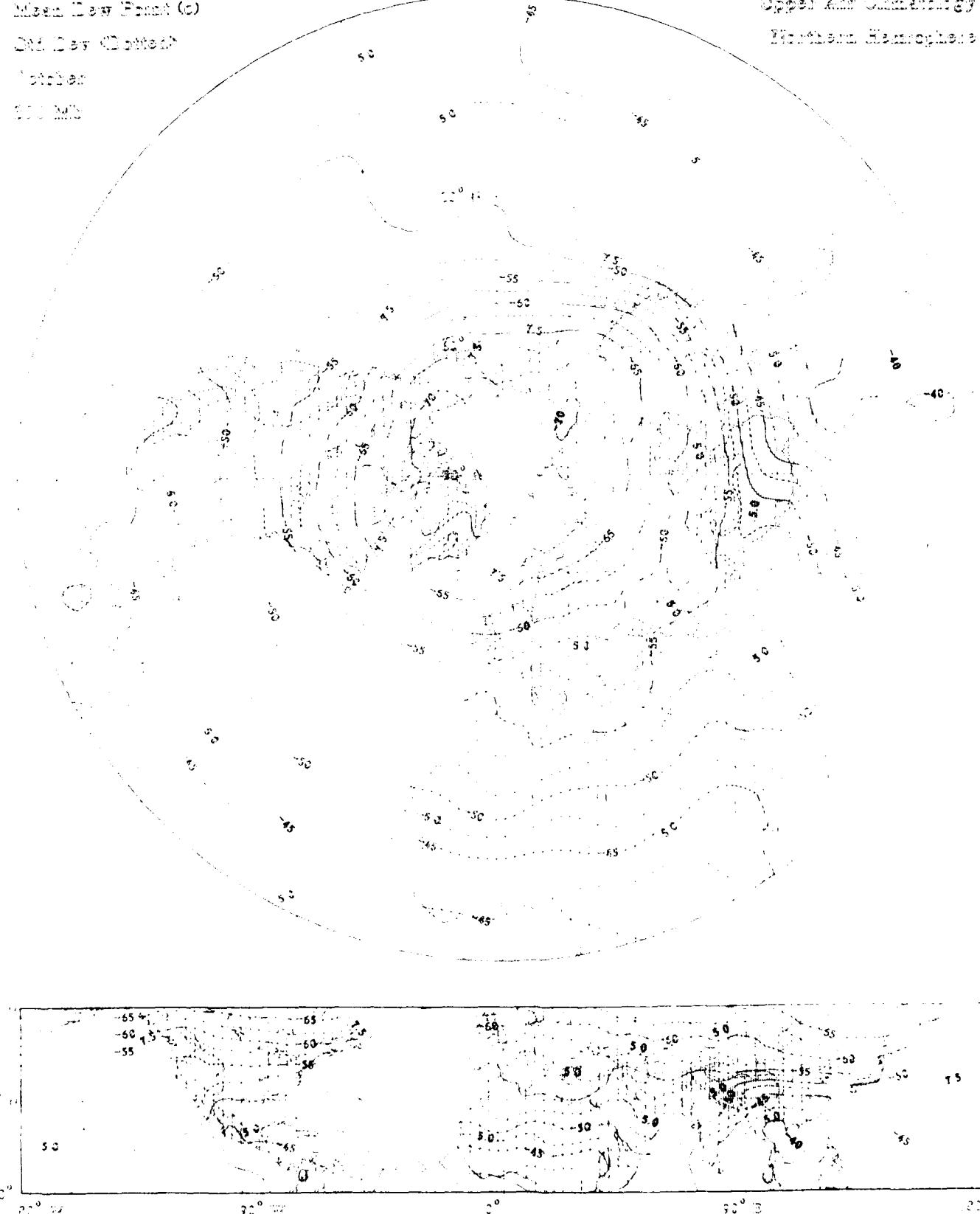
Old Dev Clotted

other

200 MIL

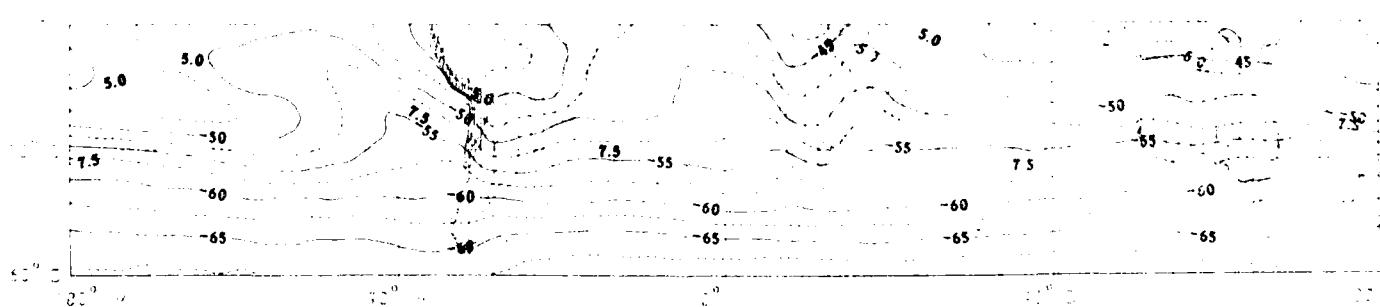
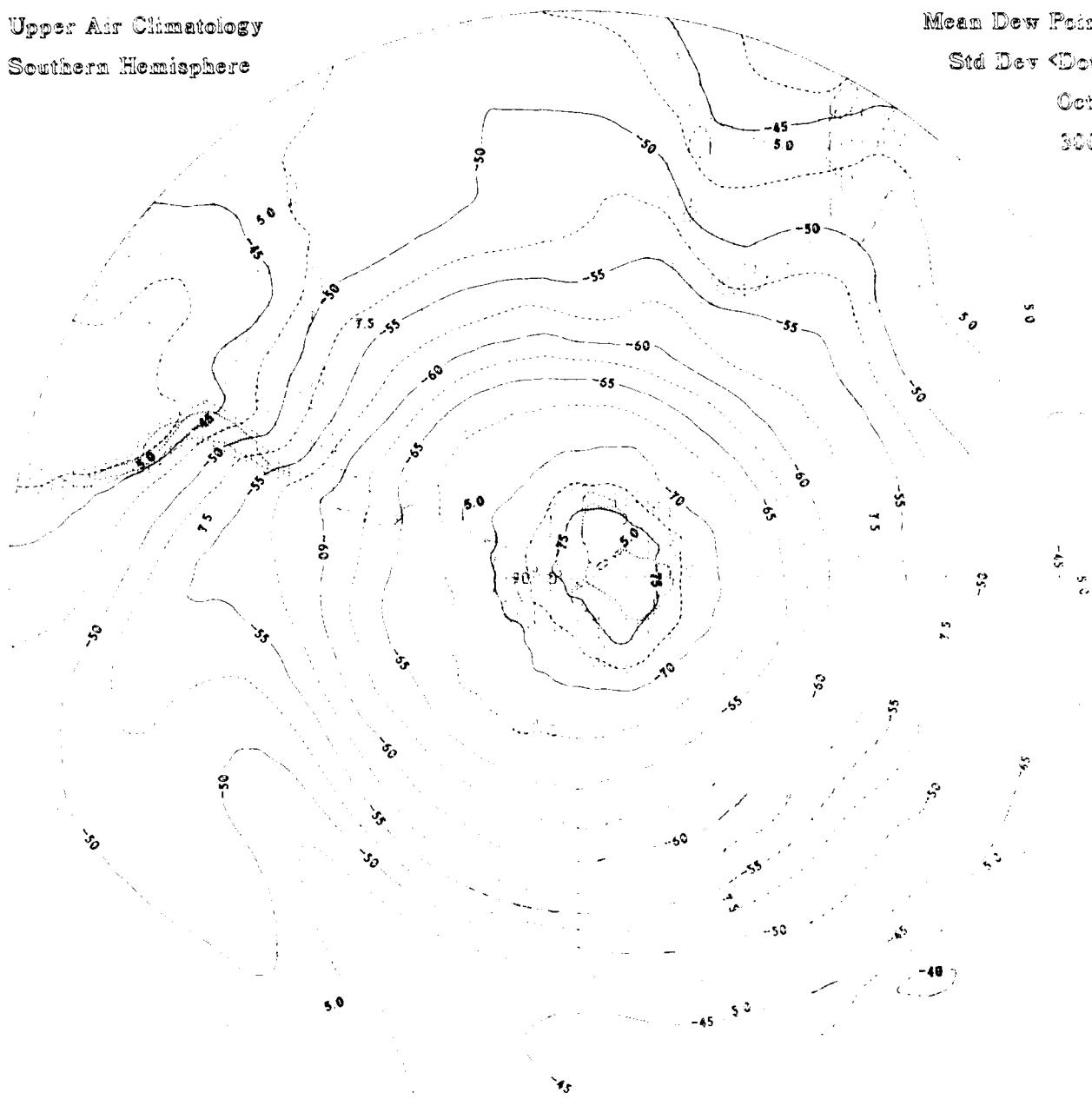
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Dew Point (°C)
Std Dev <Dotted>
October
300 MB



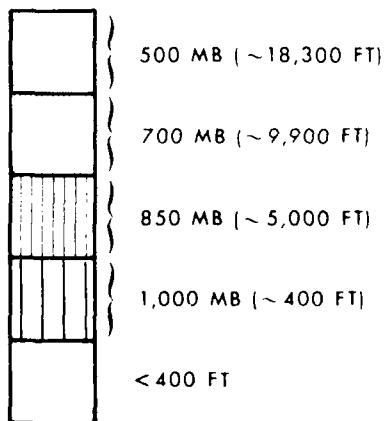
DENSITY
(13 LEVELS, 1000 TO 30 MB)

- Contours of mean density (solid and dashed lines) in kilograms/cubic meter: solids labeled, dashed intermediates unlabeled
- Density labeled interval:

.02 kilograms/cubic meter - 1000 MB to 400 MB
.01 kilograms/cubic meter - 300 MB to 200 MB
.006 kilograms/cubic meter - 150 MB to 30 MB
- Contours of standard deviation of density (dotted lines) in kilograms/cubic meter
- Standard deviation of density labeled interval:

.01 kilograms/cubic meter - 1000 MB to 400 MB
.005 kilograms/cubic meter - 300 MB to 200 MB
.003 kilograms/cubic meter - 150 MB to 30 MB
- Contours blanked for geographic areas with elevations exceeding specific geopotential heights

ELEVATION SCALE



Mixed Density (kg/m³)

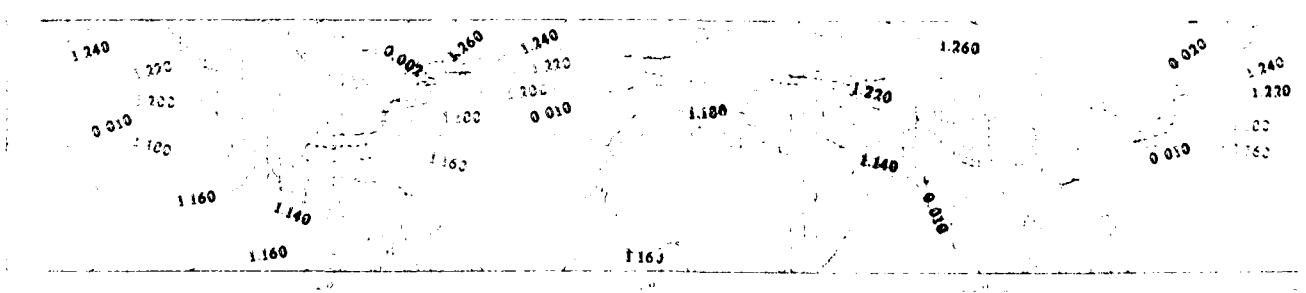
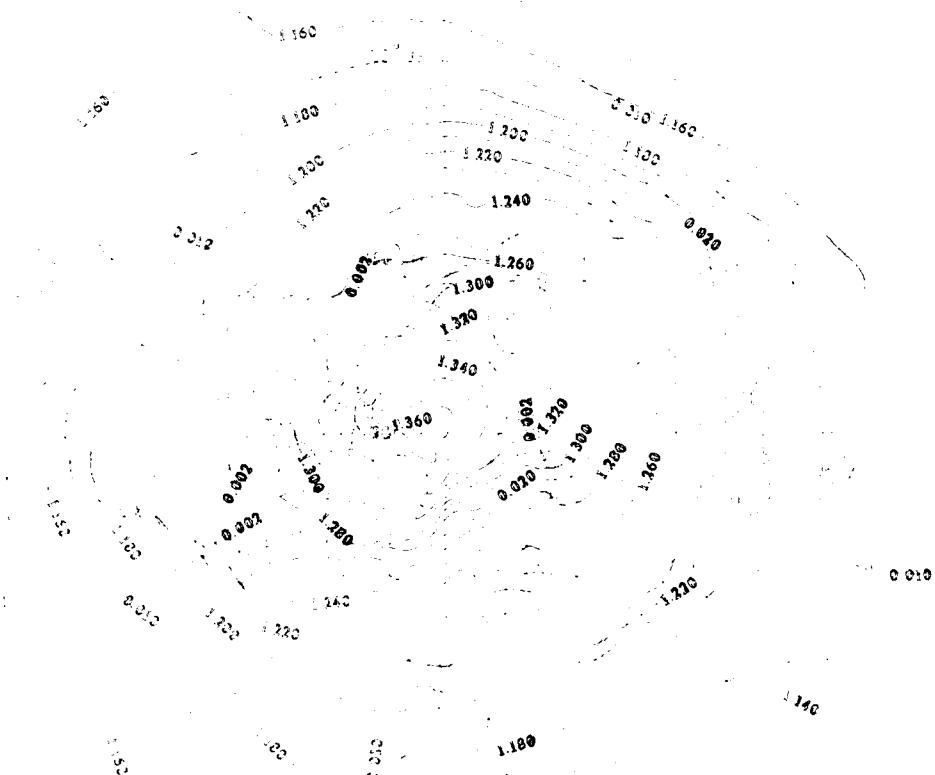
Dust Filter (kg/m³)

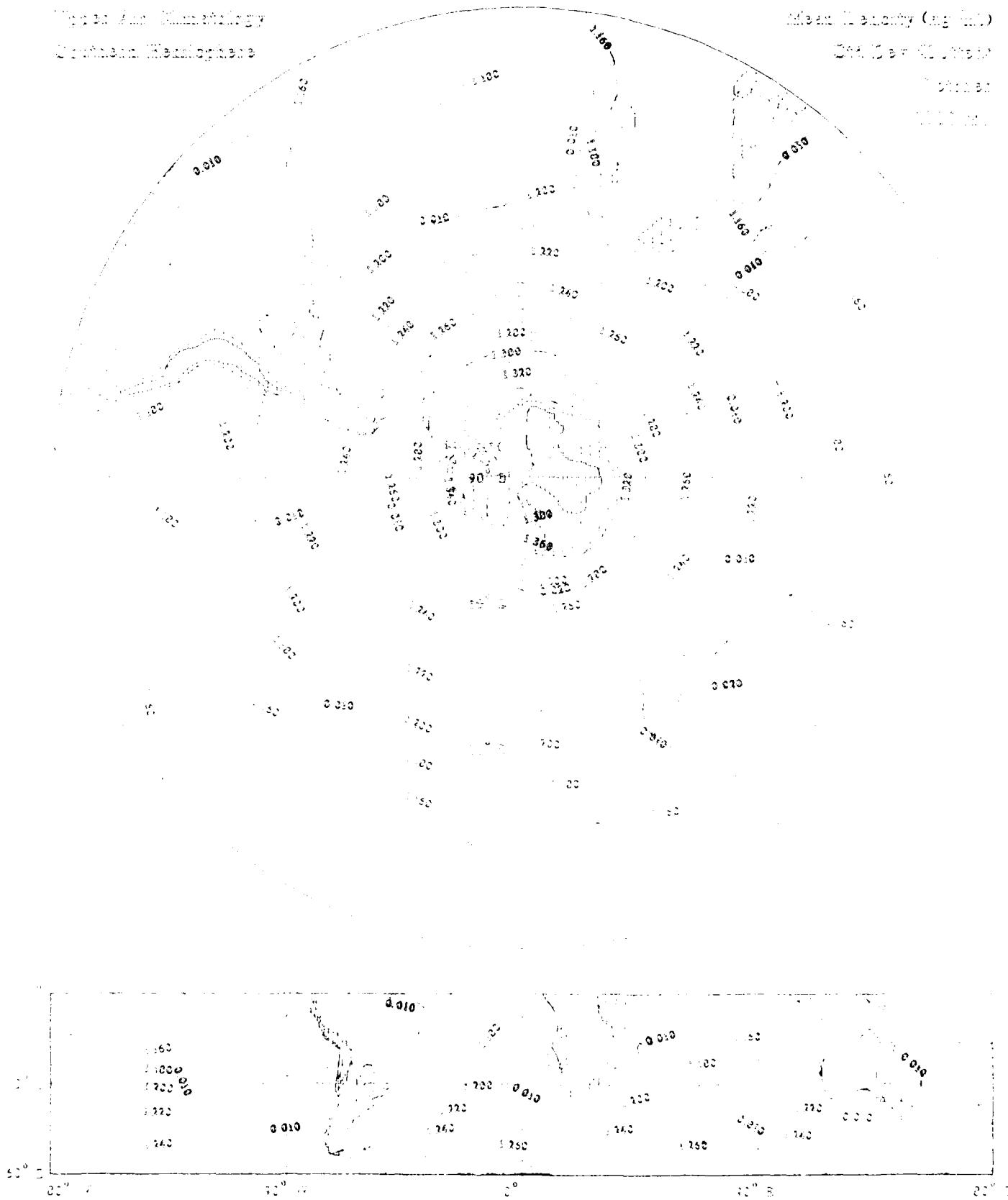
0.010

0.010 kg/m³

Upper Air Thermometry

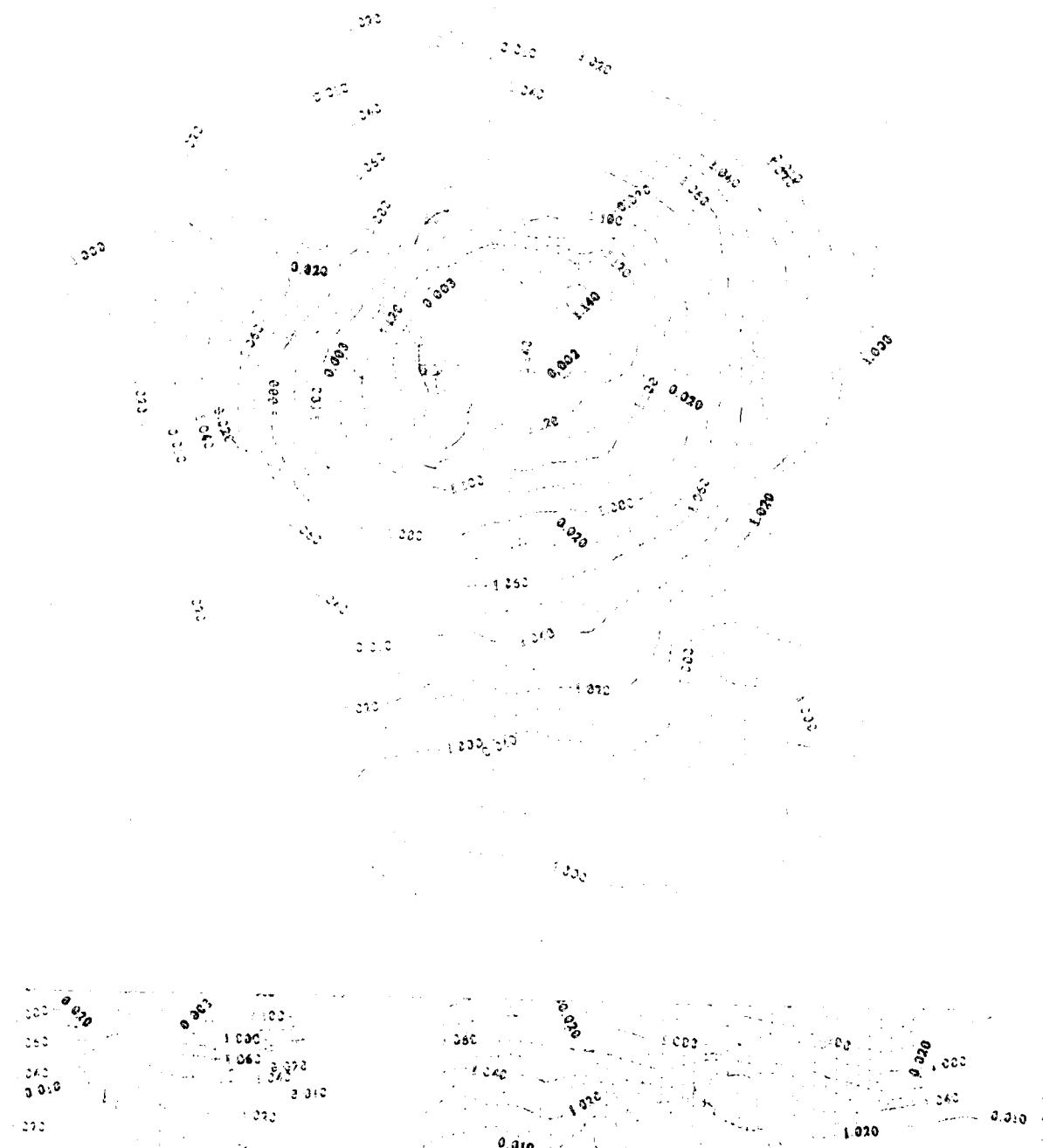
Hydrometeor Identification





Weld Times (Sec/min.)
1000 1200 1500
1000 1200 1500

Weld Times (Sec/min.)
1000 1200 1500



1983 June 22, 1983

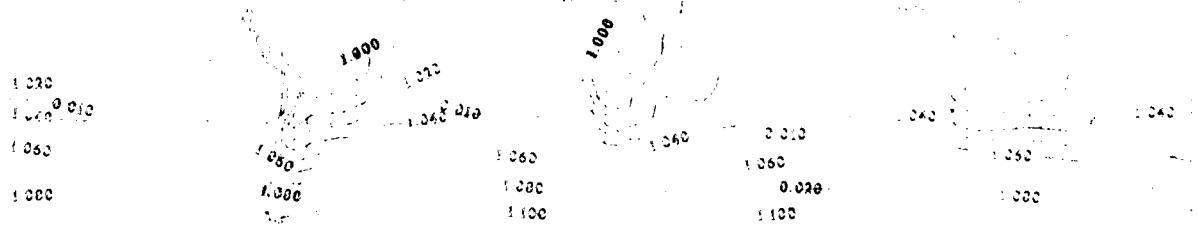
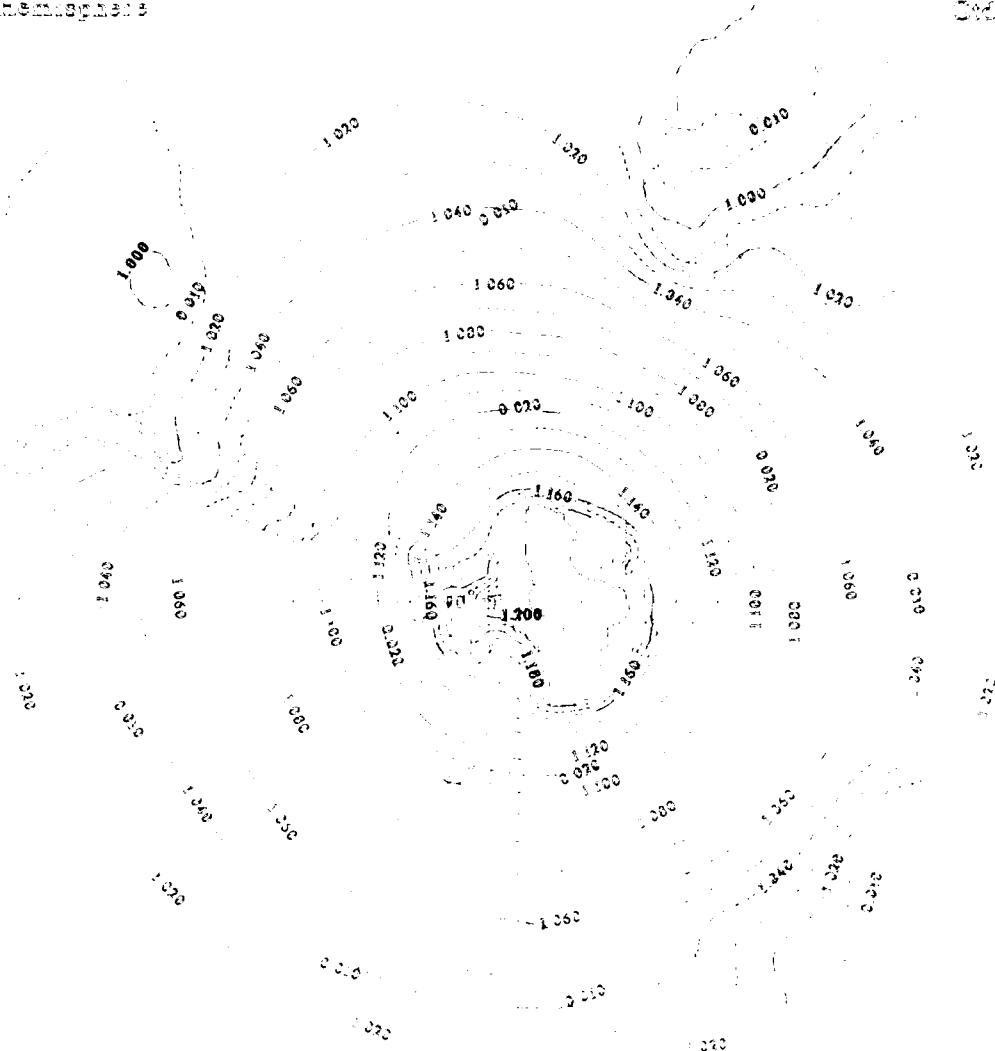
Chancery Hearings

Mass Density (kg/m³)

God bless you.

卷之三

352 M7



Mean Density (kg/m³)

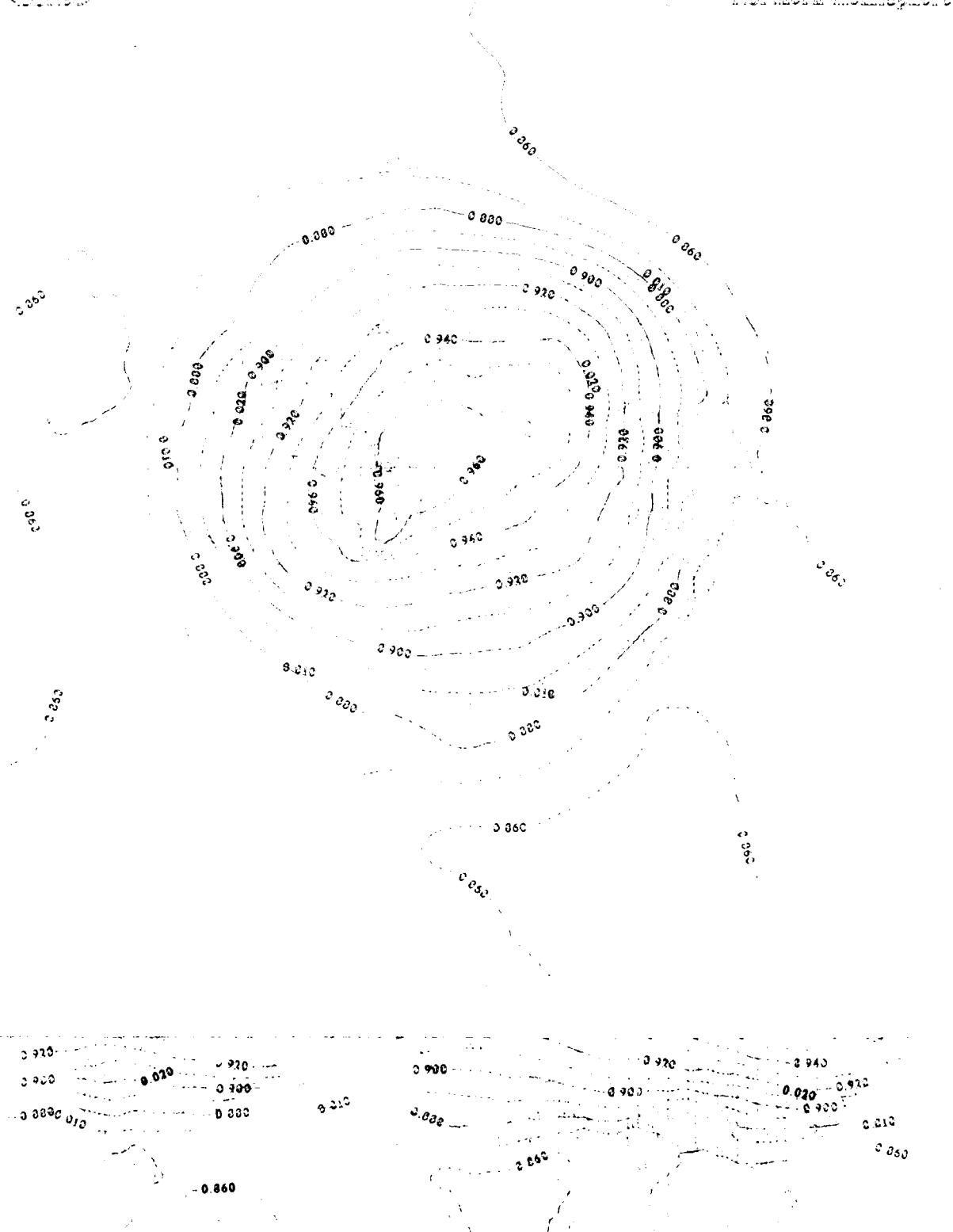
Sea Level (Contour)

Bottom

77° N

Upper Alt. Contourology

Northern Hemisphere



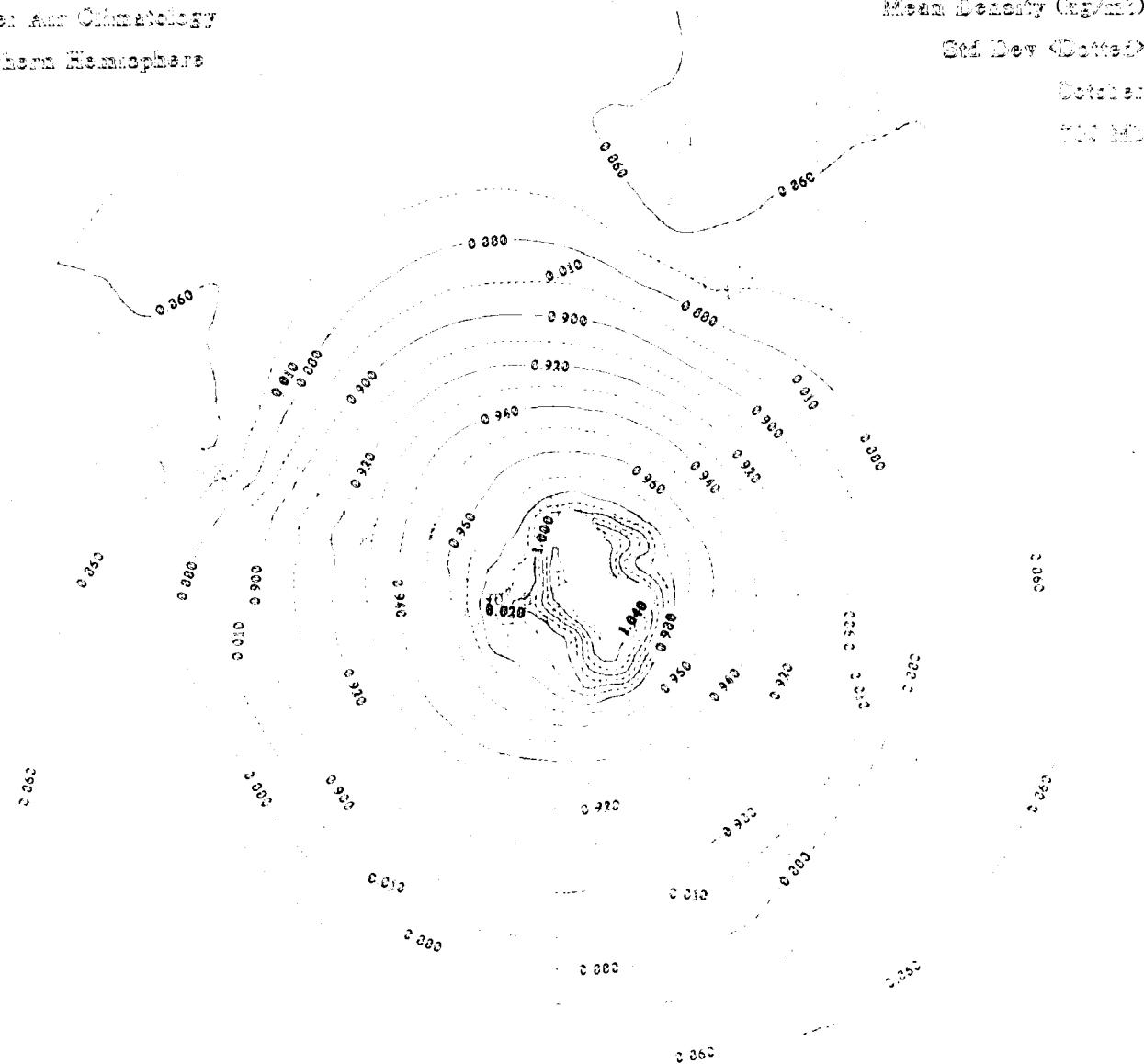
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)

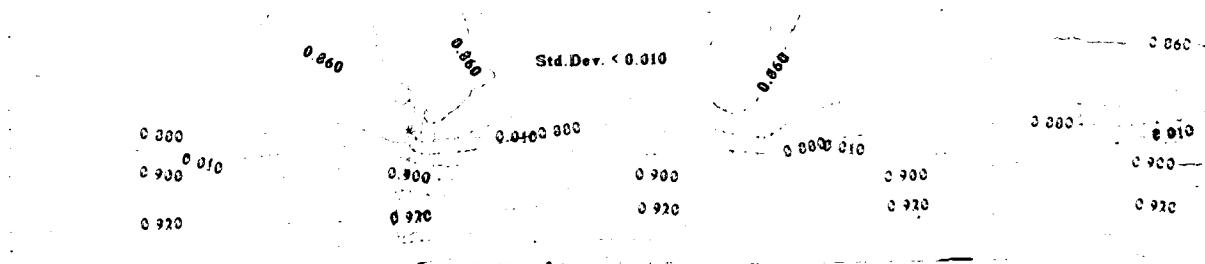
Std Dev (Dotted)

October

700 mb



Std.Dev. < 0.010



Mean Density (kg/m^3)

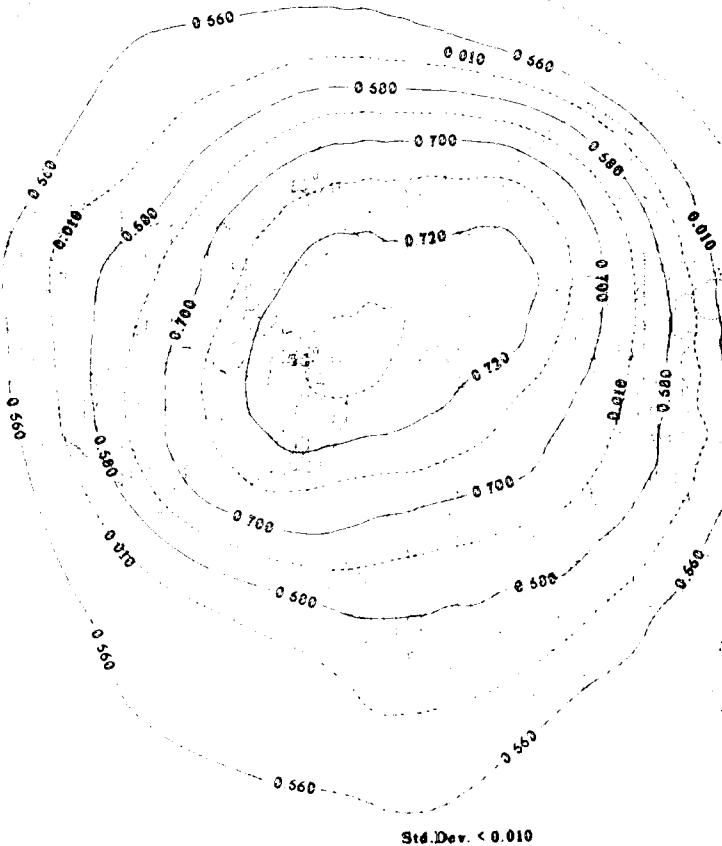
Std Dev < Dotted>

October

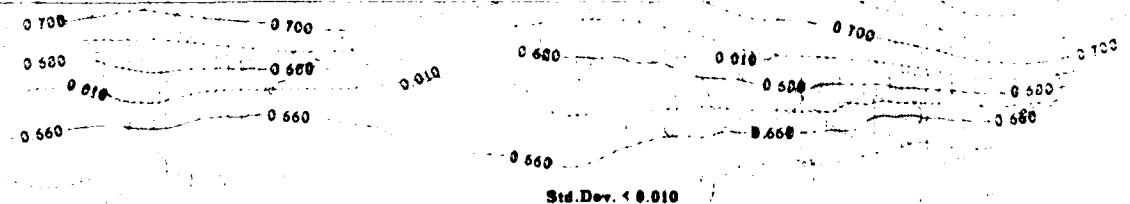
500 Mb

Upper Air Climatology

Northern Hemisphere



Std.Dev. < 0.010



Std.Dev. < 0.010

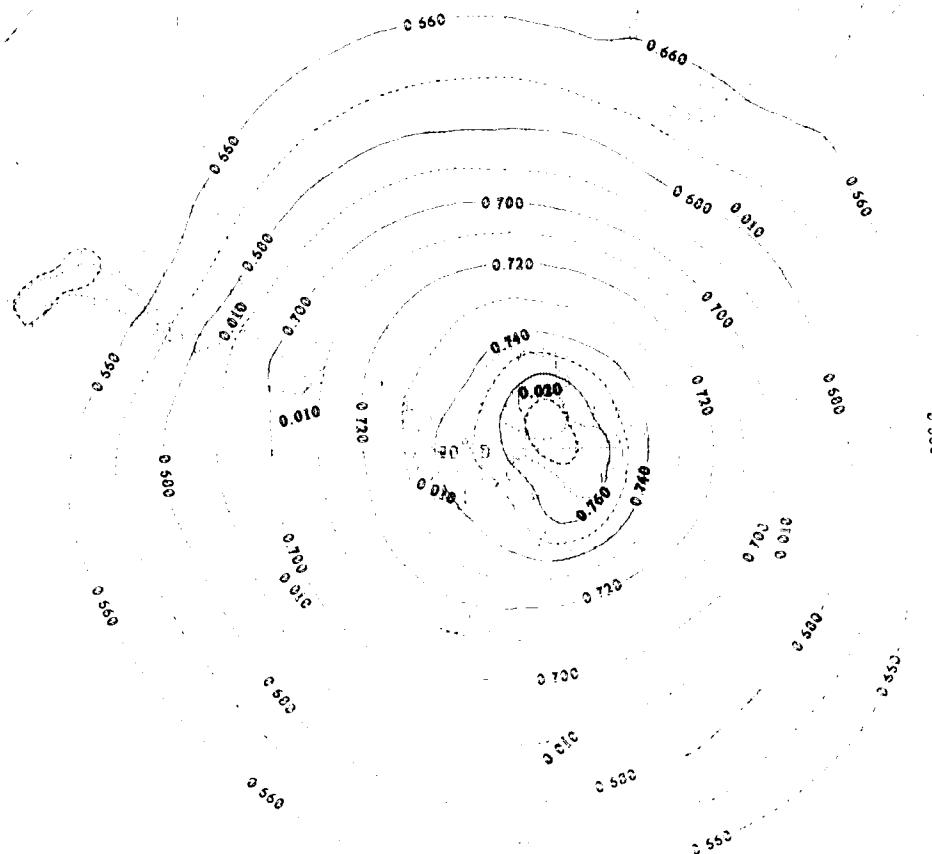
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m^3)

Std Dev < Dotted >

October

500 MB



Std. Dev. < 0.010

0.560

0.600

0.640

0.560

0.600

0.640

0.560

0.600

0.640

0.560

0.600

0.640

0.660

0.680

0.010, 0.020

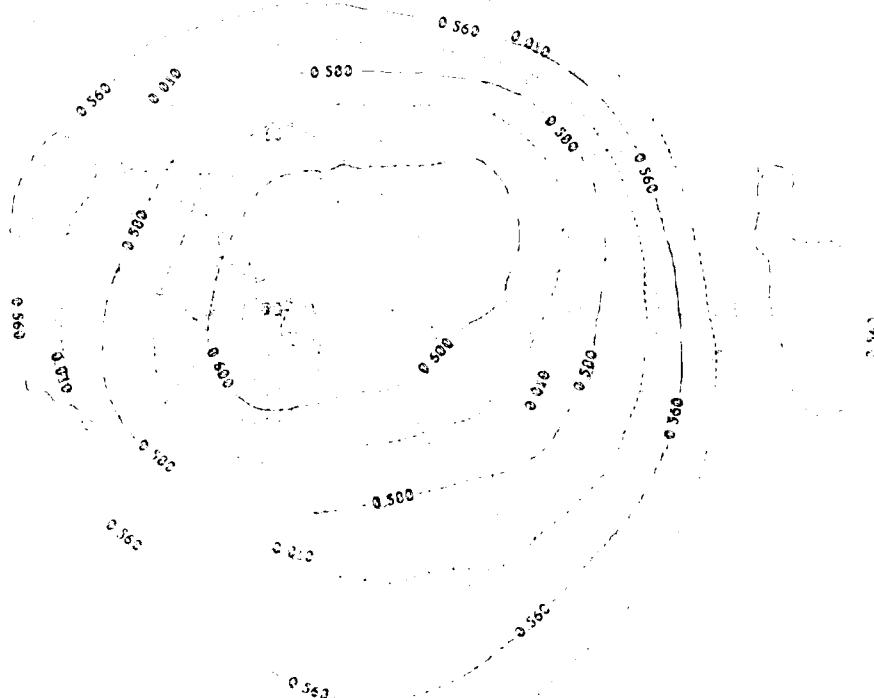
Mean Density (kg/m³)

DATA CENTER CONNECT

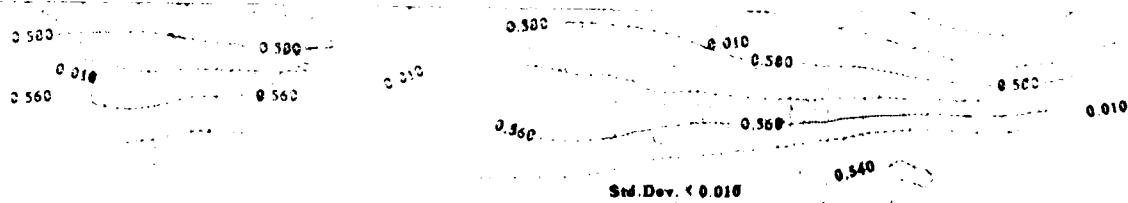
卷之三

$$G_1 \geq \frac{1}{2} - \frac{N_1 \epsilon^2}{\lambda_{\min}(A)}$$

Topics in Atmospheric Numerical Meteorology



Std.Dev. < 0.010



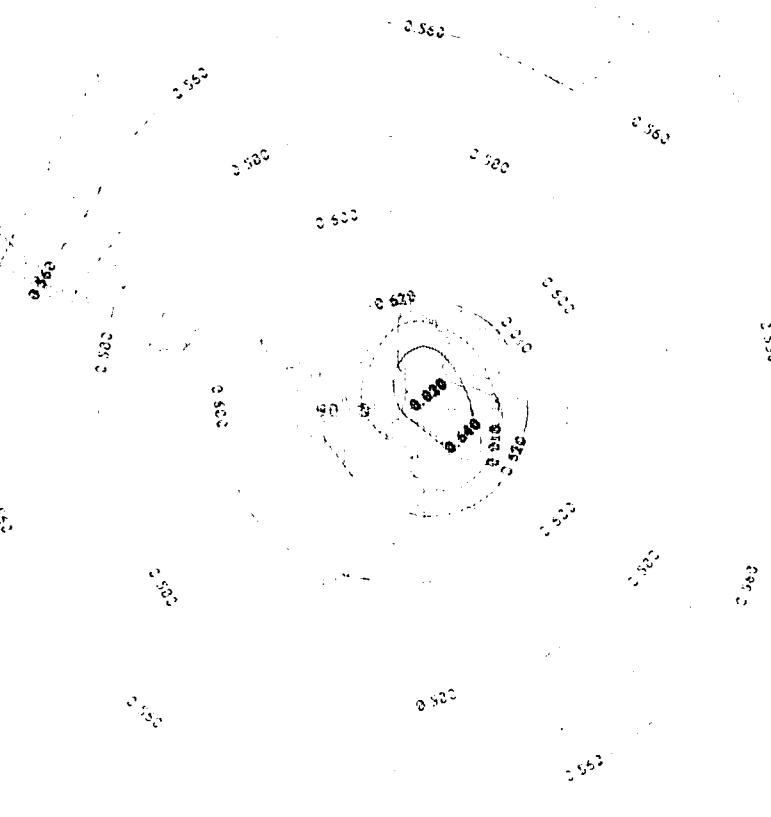
Std.Dev. < 0.015

Digitized by srujanika@gmail.com

Classification of the species

Mean latency (ms)

2021-22 年 G2 班級評語



Std.Dev < 0.010

0.560 0.560 Std Dev. 0.010 0.560 0.560
0.560 0.560 0.560 0.560 0.010 0.560

Mean ID Density (kg/m²)

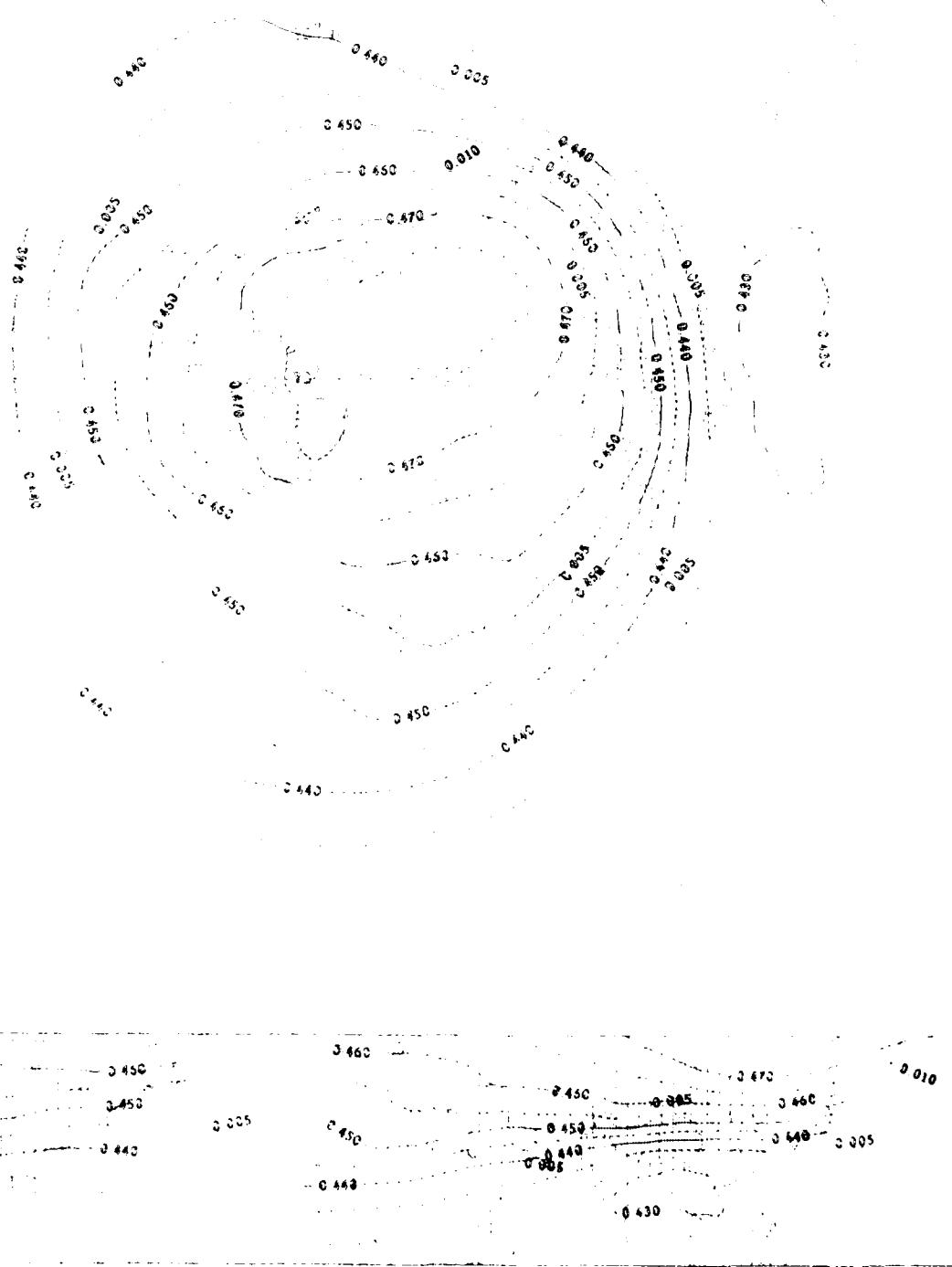
One Day (Dated)

October

500 MHz

Upper Air Climatology

Northern Hemisphere



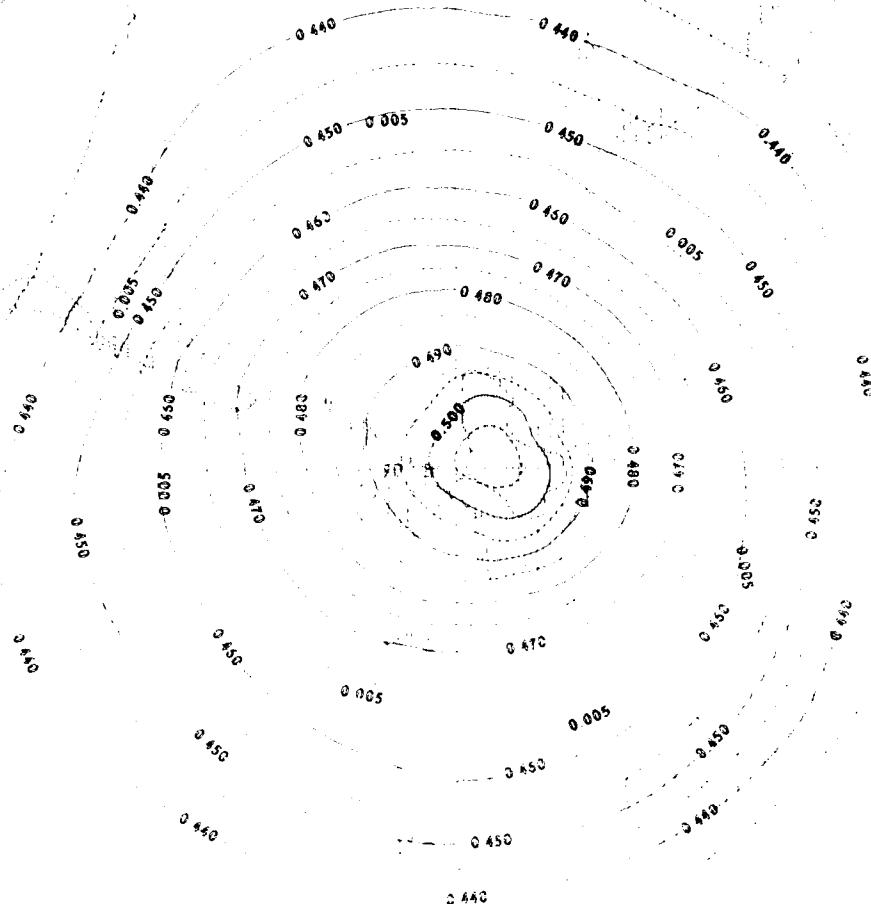
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)

Std Dev < 0.005

October

300 MB



Std.Dev. < 0.005

Std.Dev. < 0.005

0.440	0.440	0.440	0.440
0.450	0.450	0.450	0.450
0.005	0.460	0.460	0.460
0.460	0.460	0.460	0.460
0.470	0.470	0.470	0.470

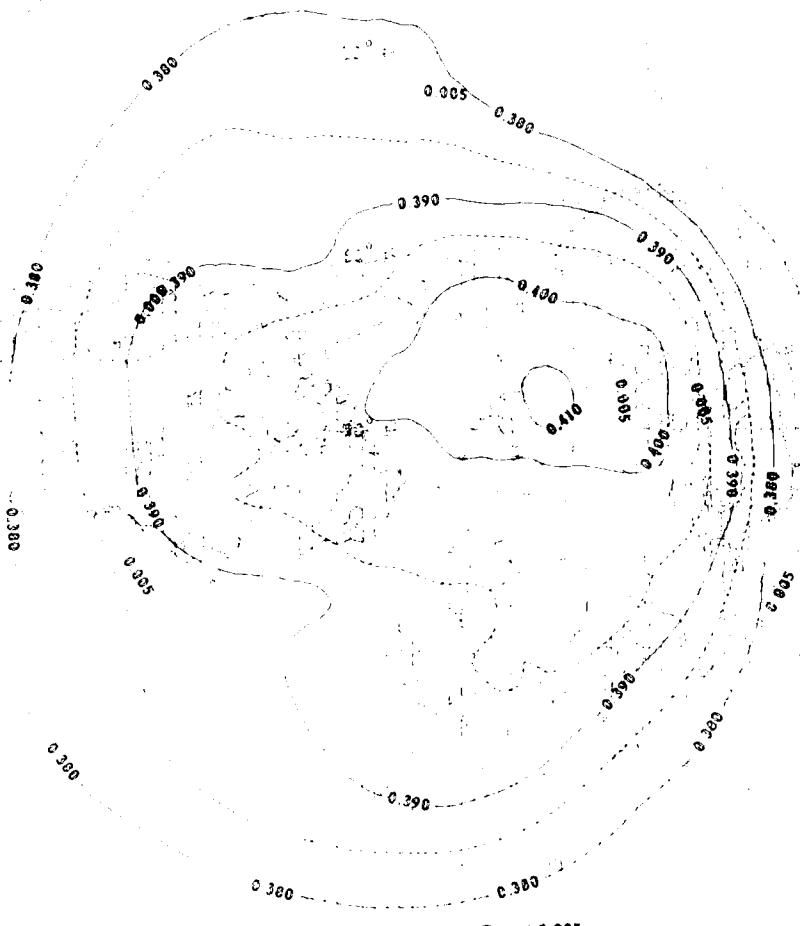
Mean Density (kg/m^3)

Std Dev < Dotted >

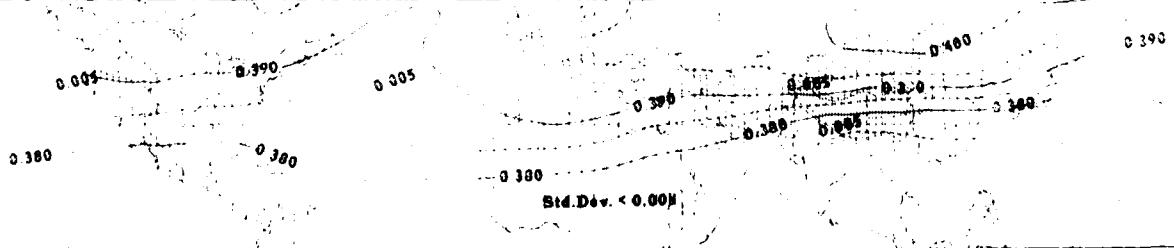
Dotcher

250 Mb

Upper Air Climatology
Northern Hemisphere



Std.Dev. < 0.005



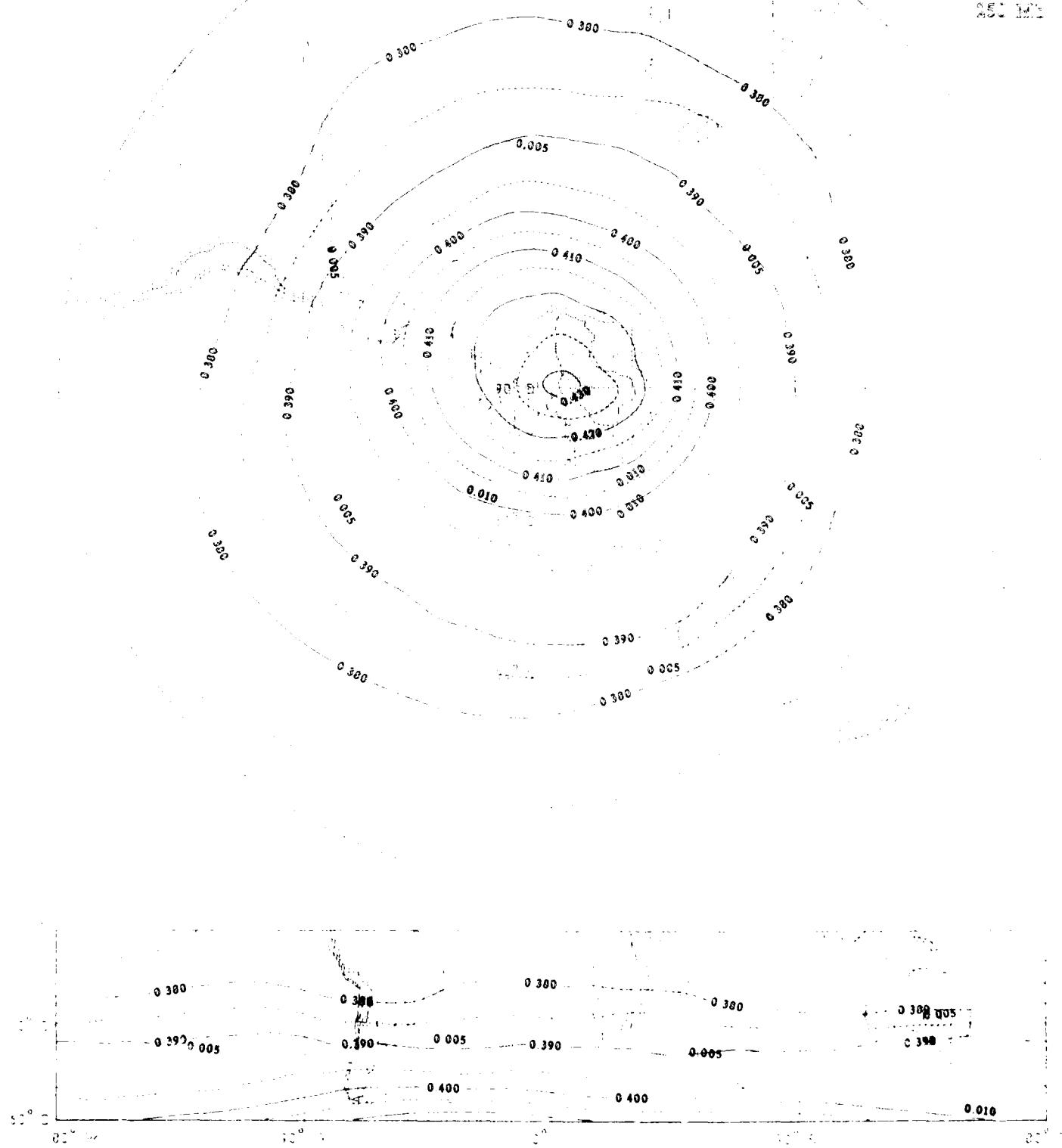
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m^3)

Std Dev (Dotted)

October

25° M.



Mean Density (kg/m³)

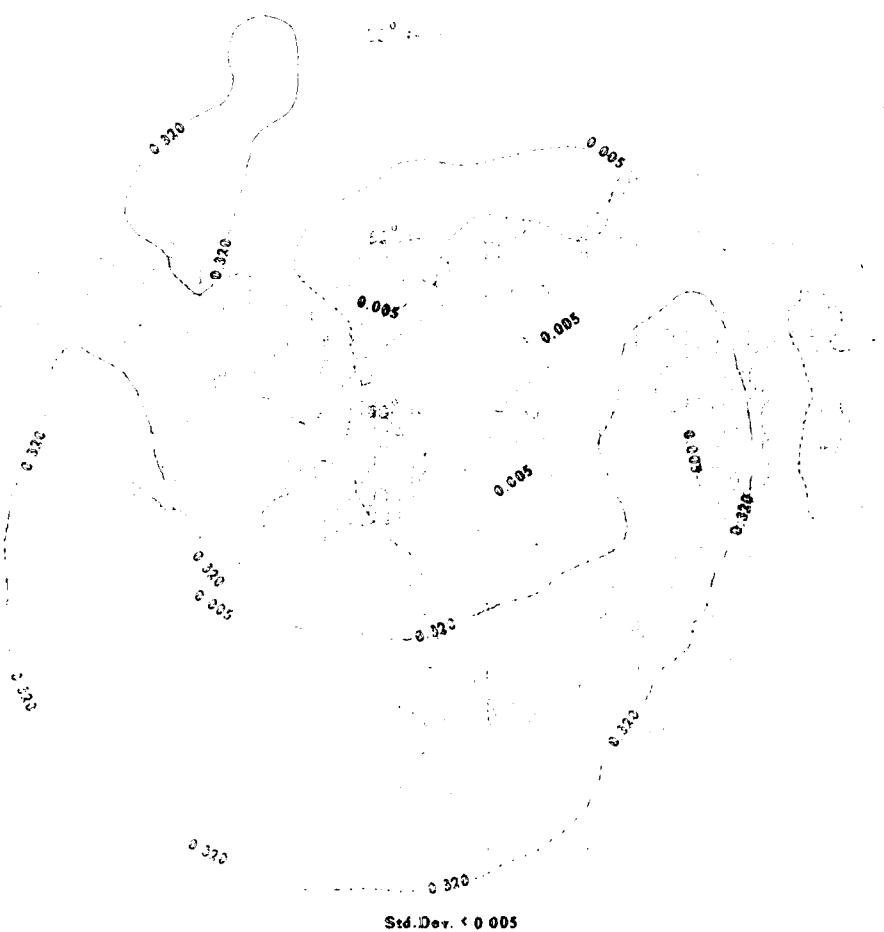
Upper Air Climatology

Northern Hemisphere

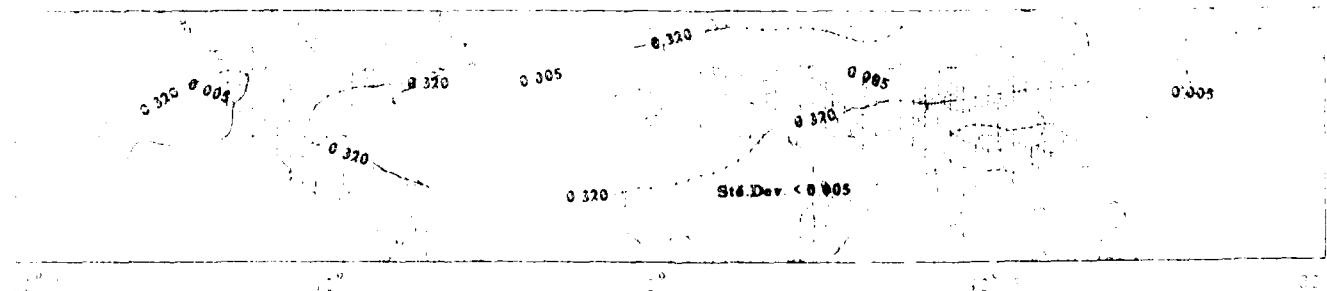
Std Dev <Dotted>

October

300 MS



Std.Dev. < 0.005



188

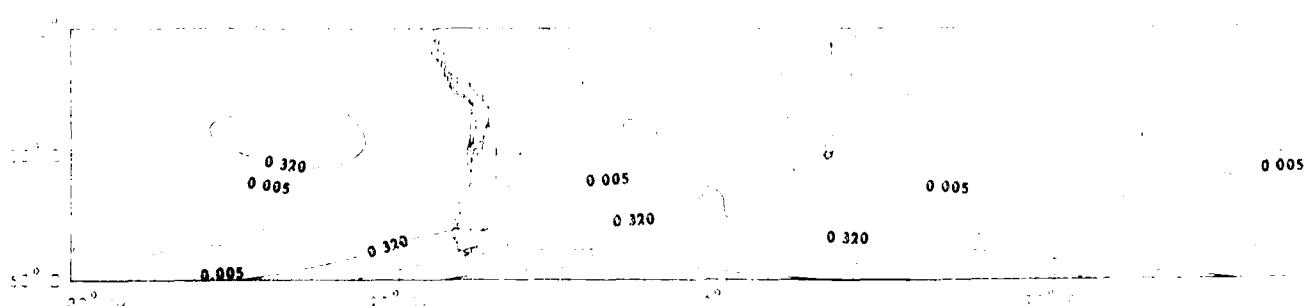
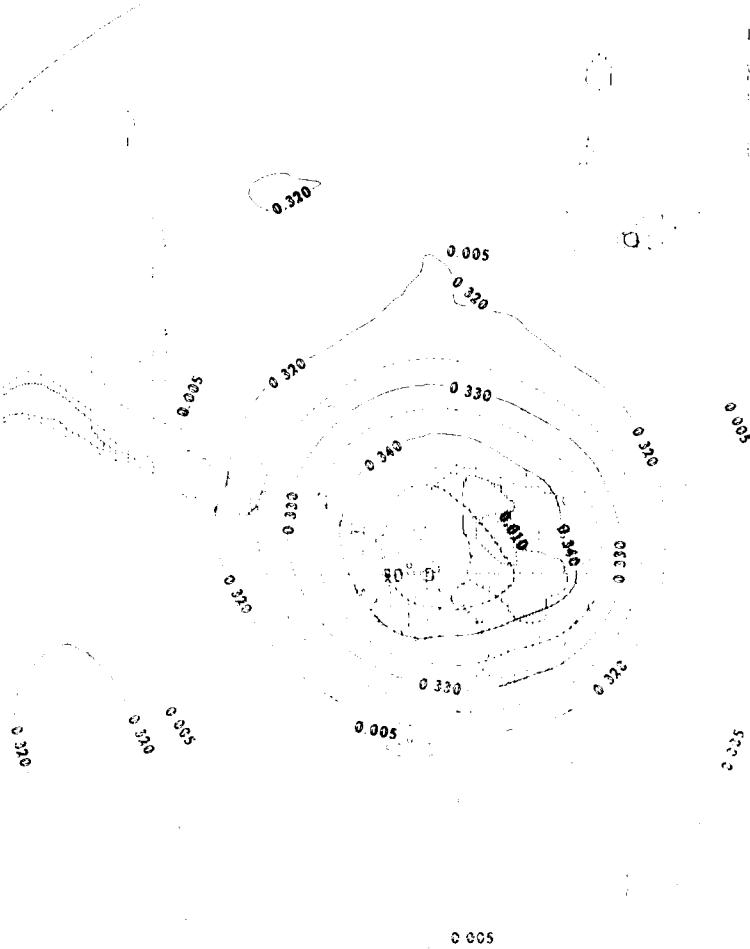
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m^3)

Std Dev (Gotted)

October

65° S 50° S



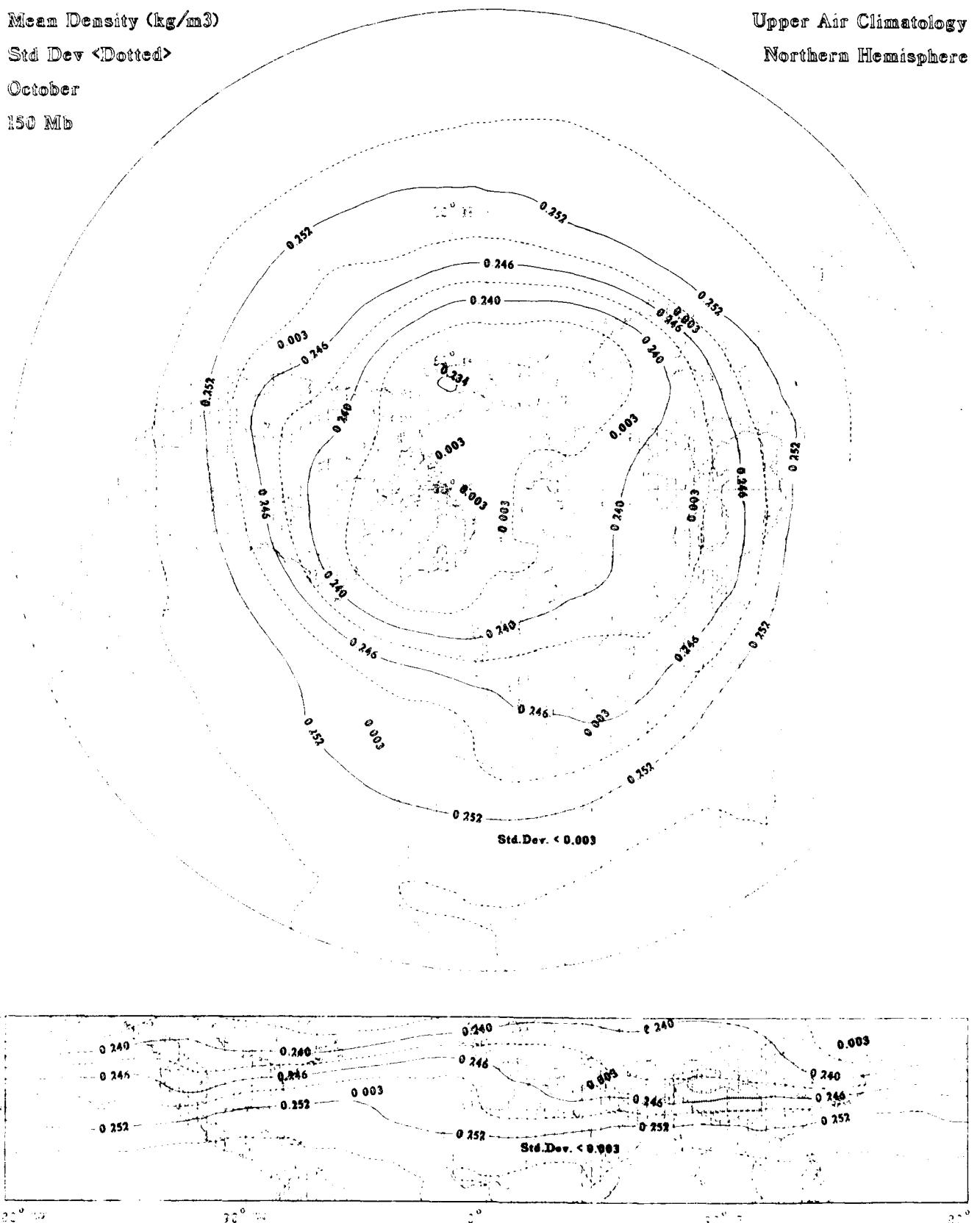
Mean Density (kg/m³)

Upper Air Climatology

Std Dev <Dotted>

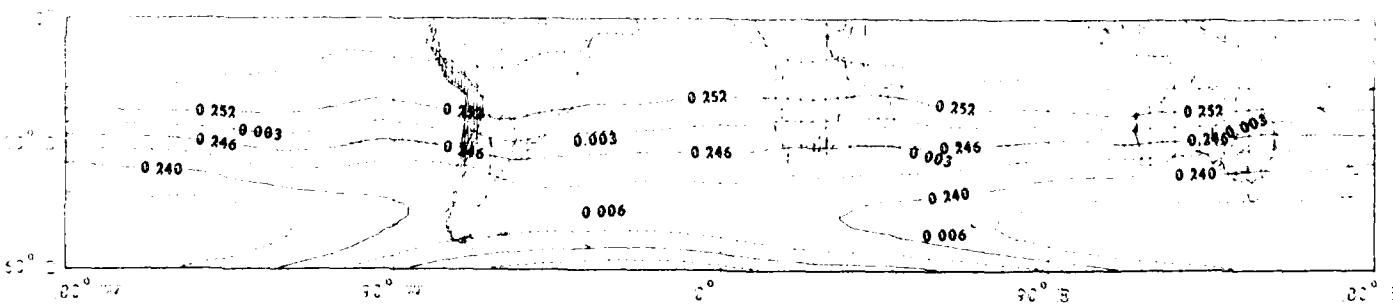
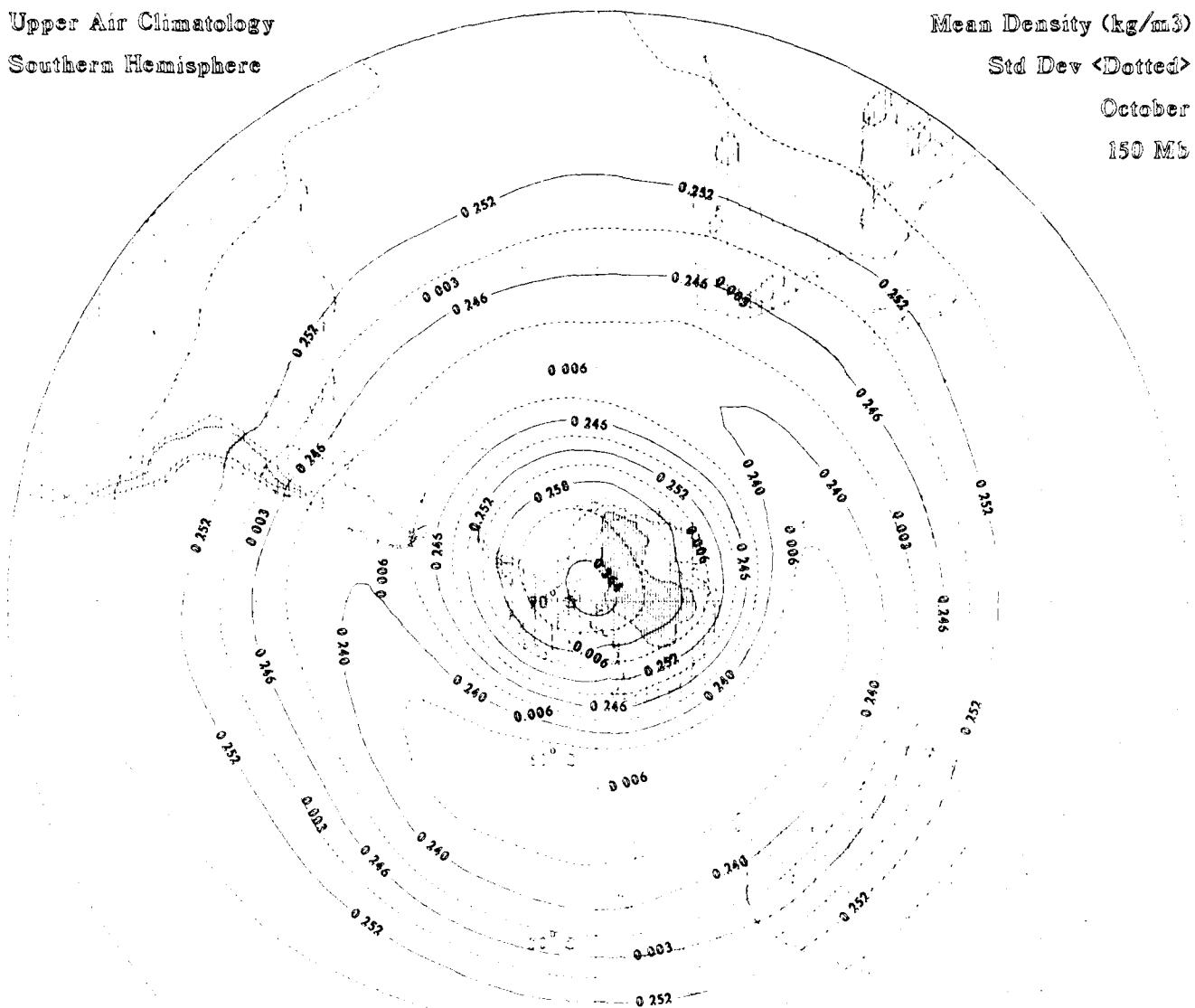
October

150 Mb



Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m^3)
Std Dev < Dotted >
October
150 Mb



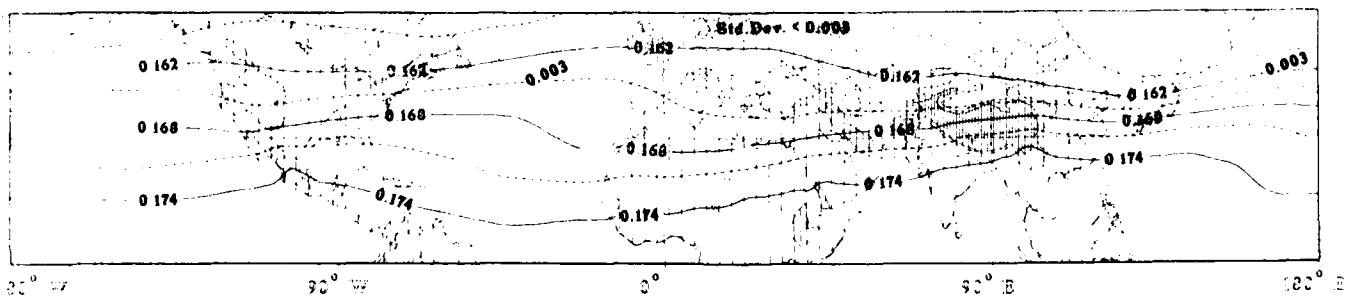
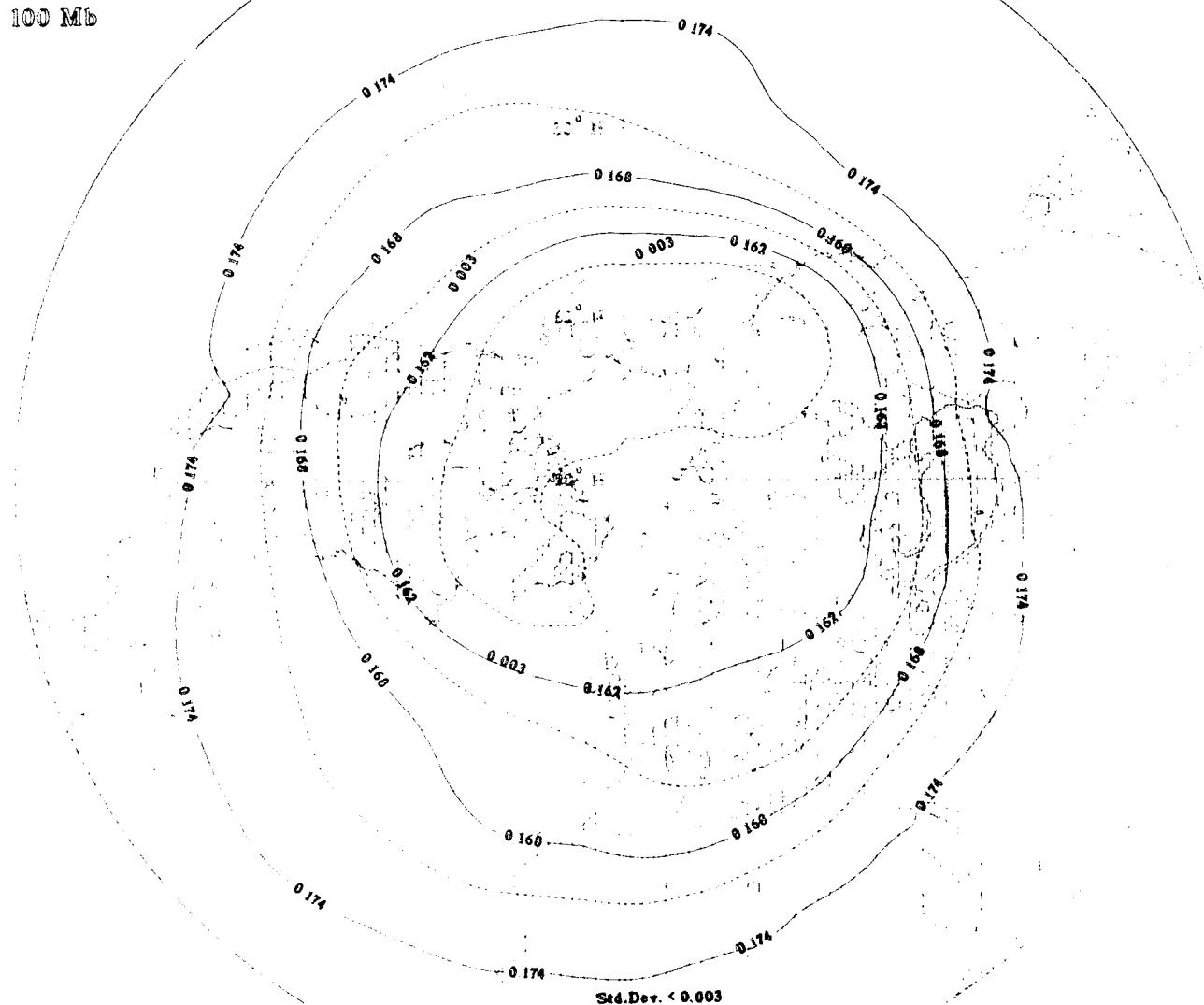
Mean Density (kg/m^3)

Std Dev < Dotted >

October

100 Mb

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology

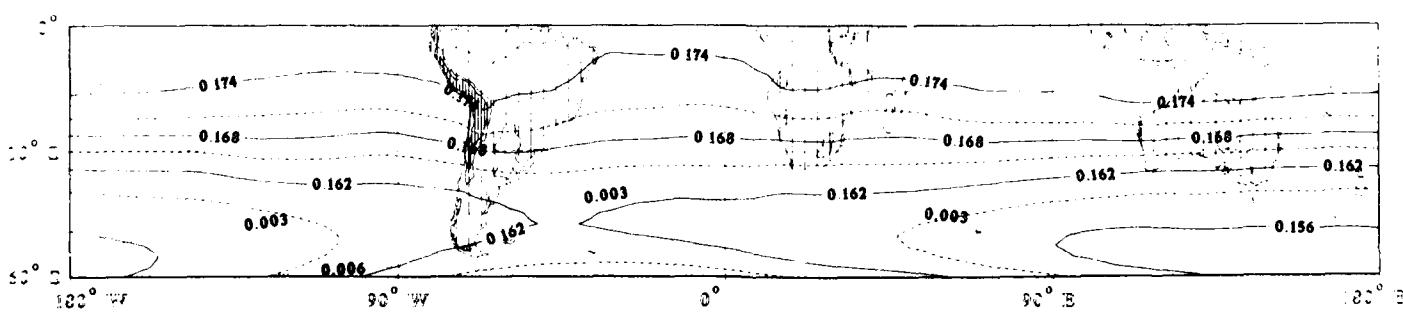
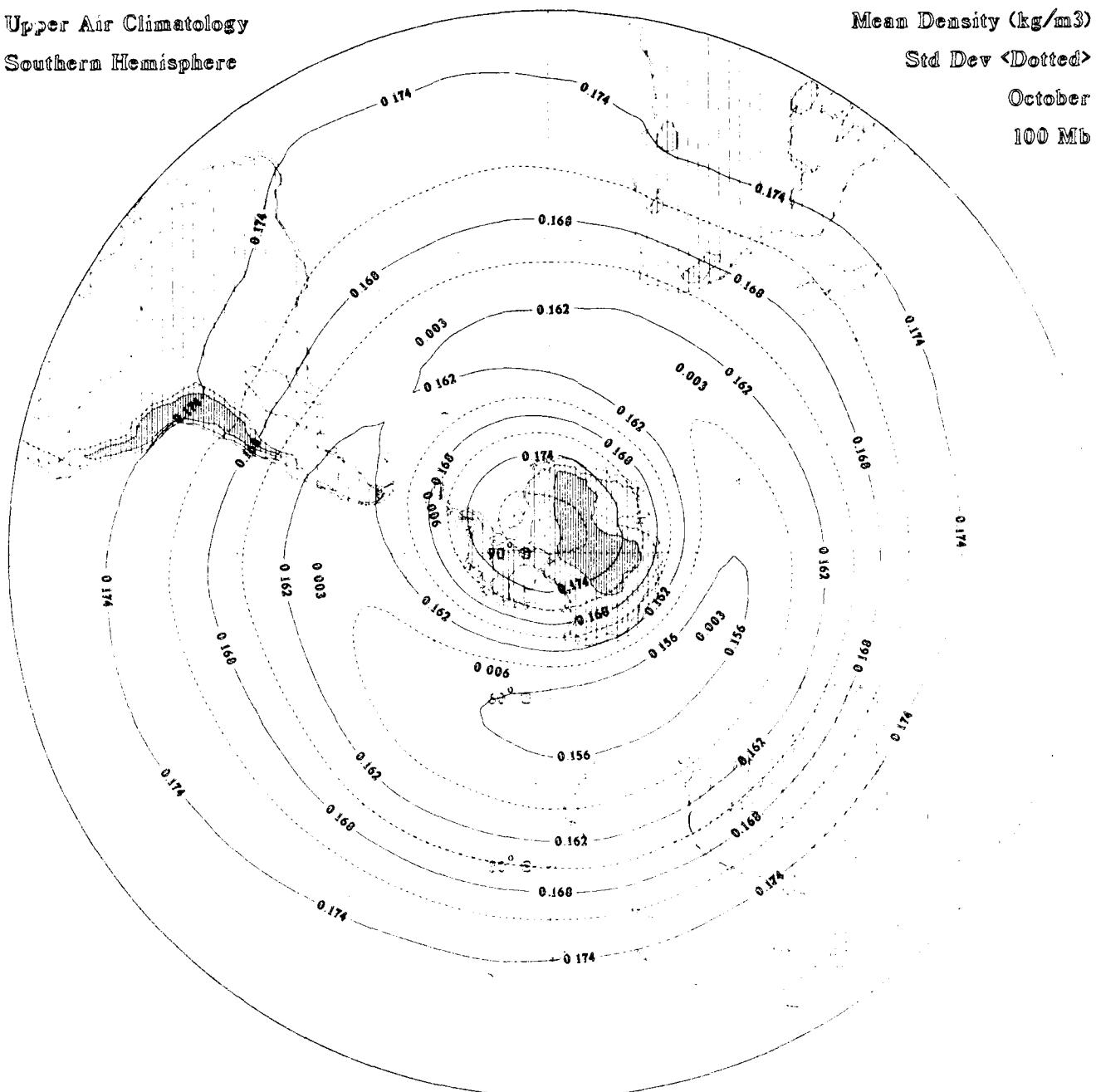
Southern Hemisphere

Mean Density (kg/m^3)

Std Dev < Dotted >

October

100 Mb



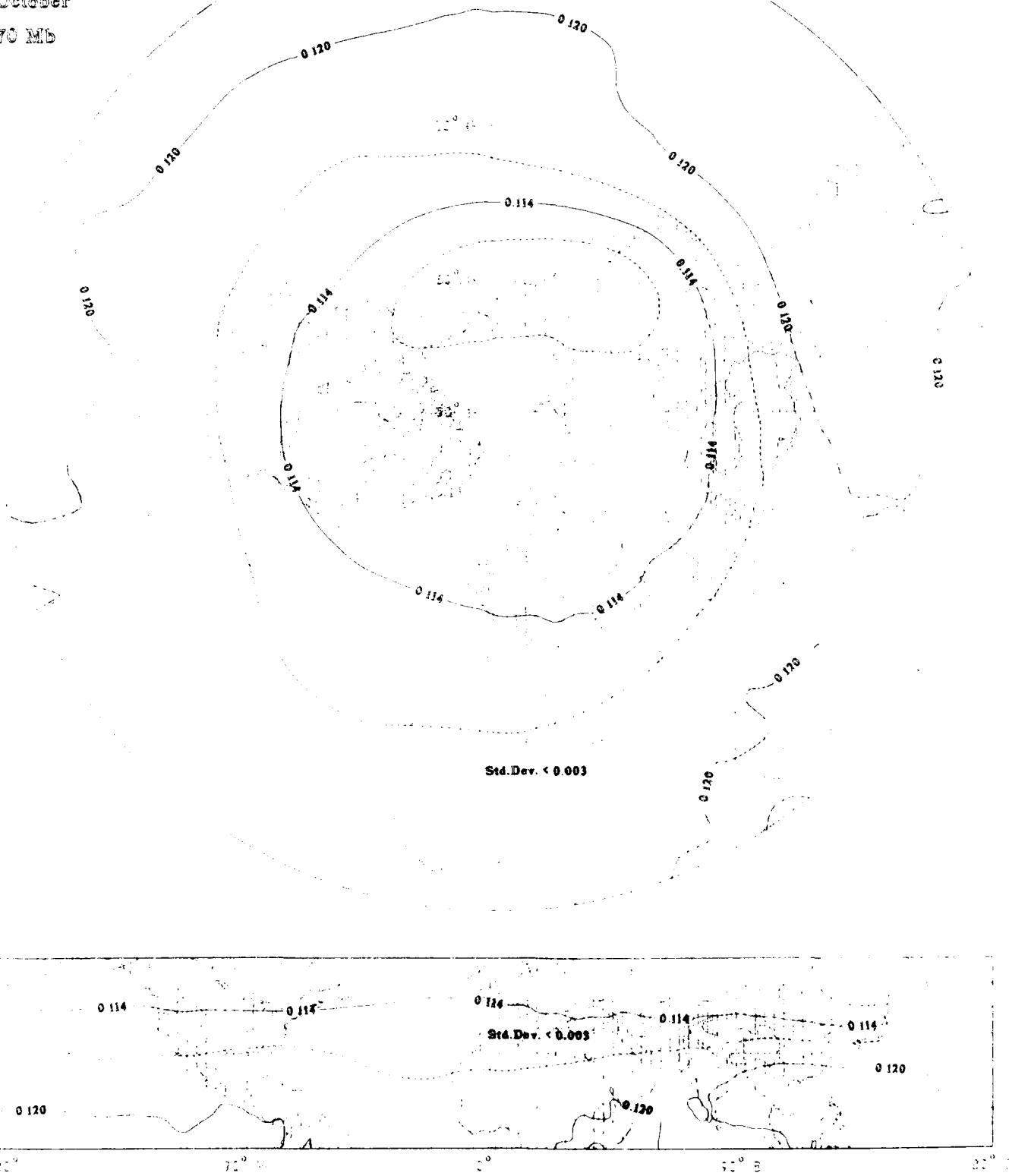
Mean Density (kg/m^3)

Std Dev < Dotted >

October

70 Mb

Upper Air Climatology
Northern Hemisphere



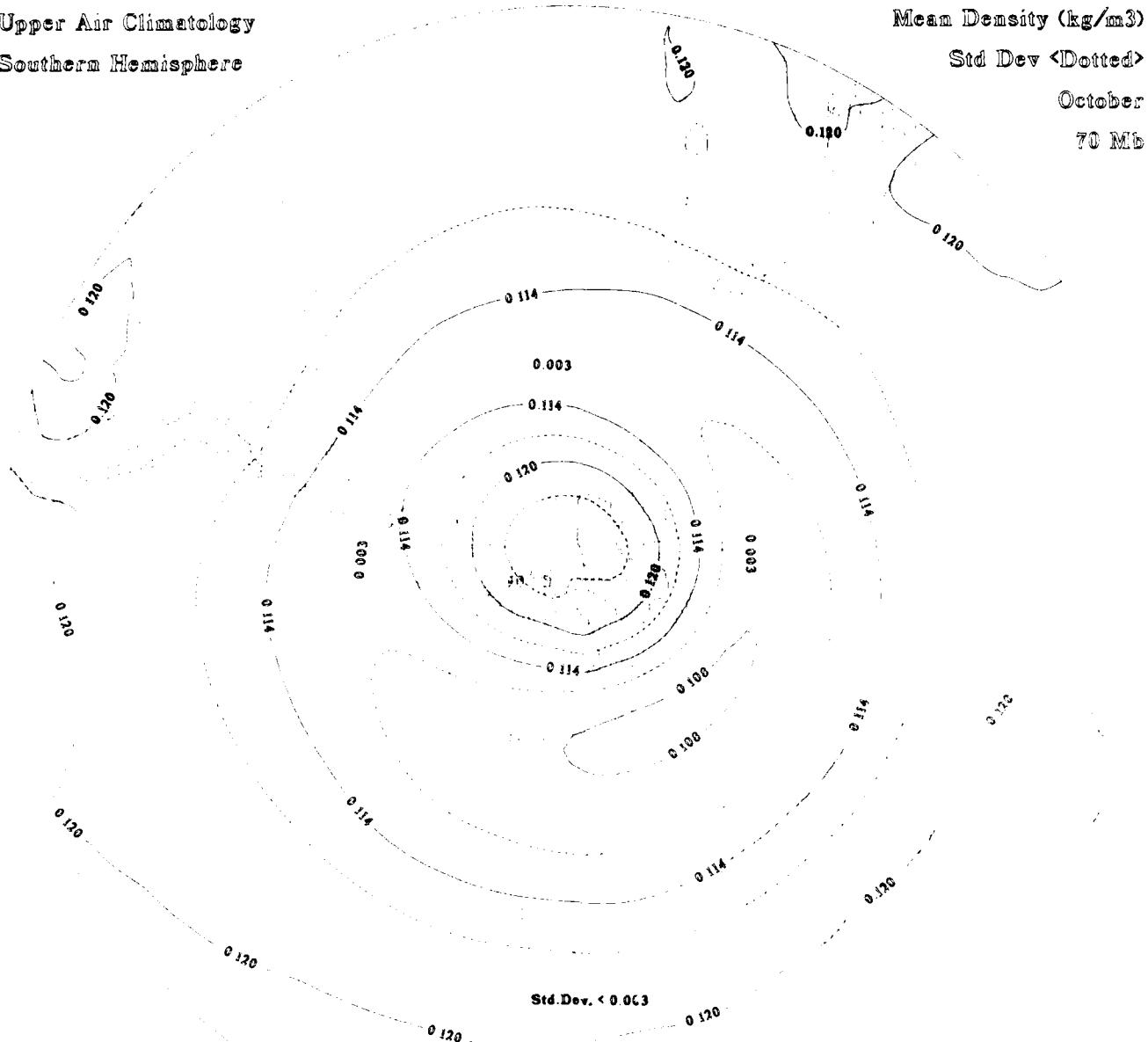
Upper Air Climatology Southern Hemisphere

Mean Density (kg/m³)

Std Dev <Dotted>

October

70 M&B



Std. Dev. < 0.003

Mean Density (kg/m^3)

Std Dev < Dotted >

October

50 Mb

Upper Air Climatology

Northern Hemisphere

120° E

90° E

60° E

30° E

0°

30° W

60° W

90° W

120° W

(0.081)

(0.081)

Std.Dev. < 0.003
Density > 0.081

Std.Dev. < 0.003
(0.081)
Density > 0.081

Upper Air Climatology

Southern Hemisphere

Mean Density (kg/m^3)

Std Dev < Dotted >

October

50 Mb

Std.Dev. < 0.003

Std.Dev. < 0.003

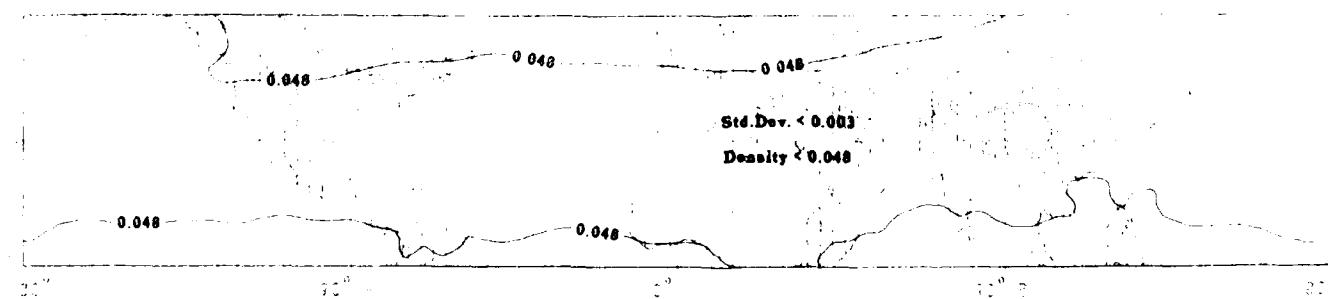
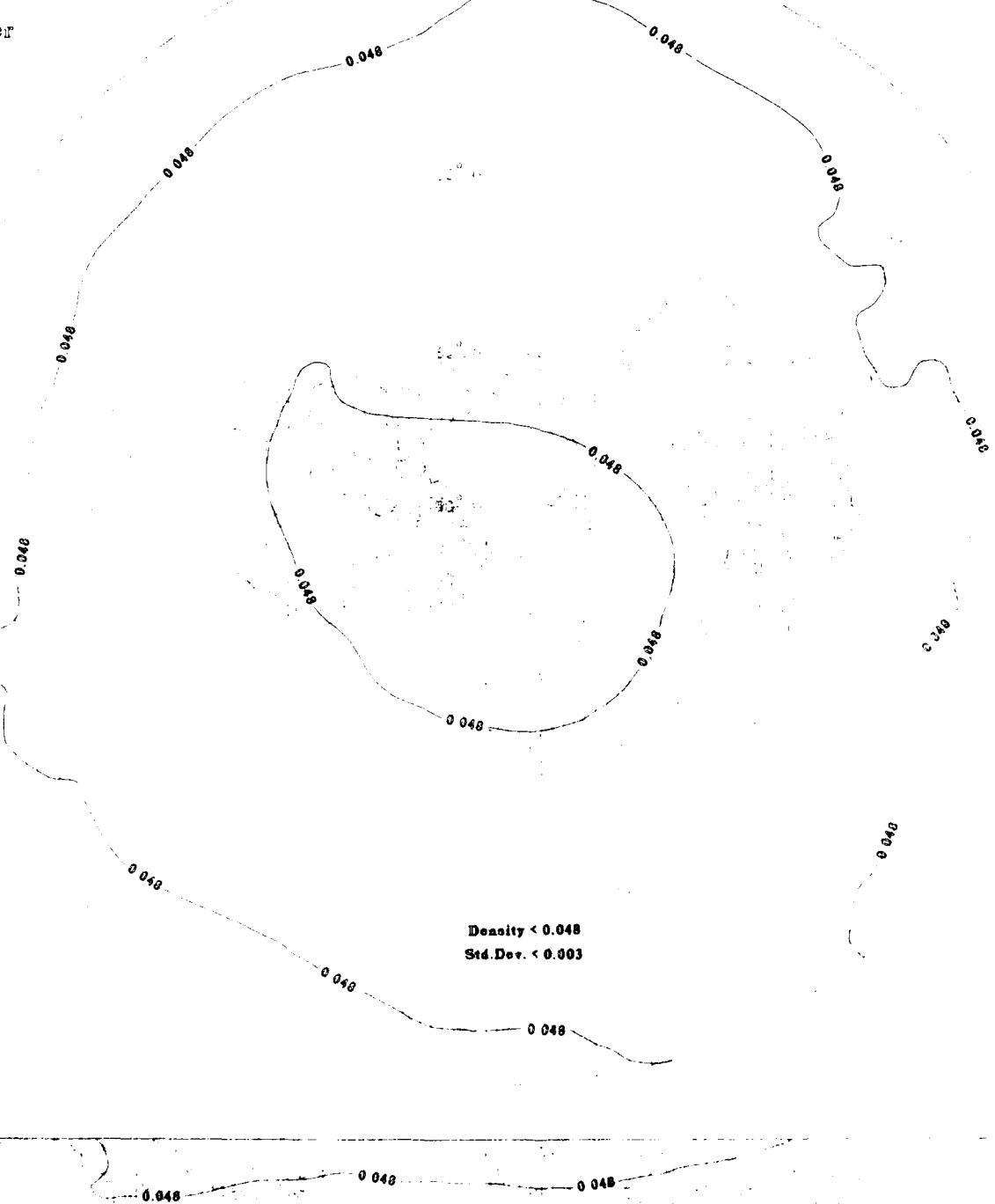
Mean Density (kg/m^3)

Std Dev < Dotted >

October

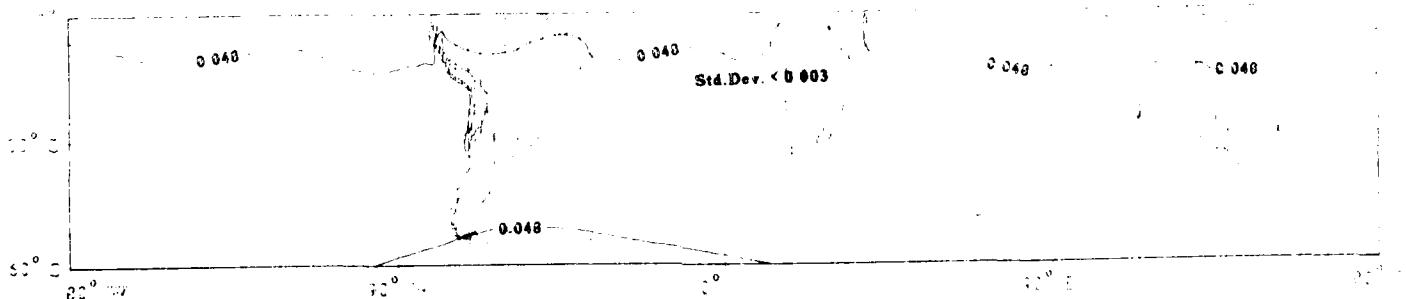
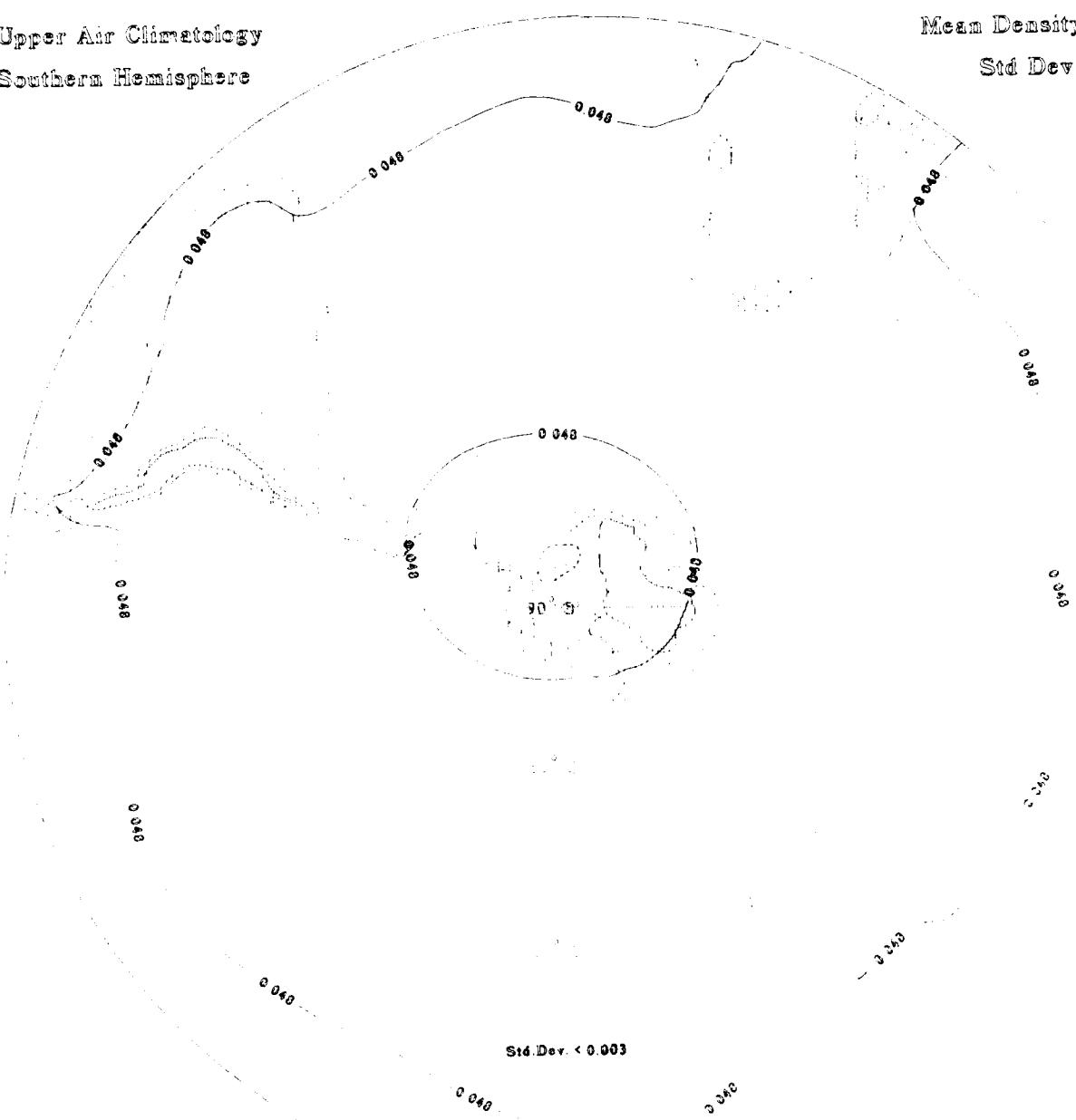
30 Mb

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

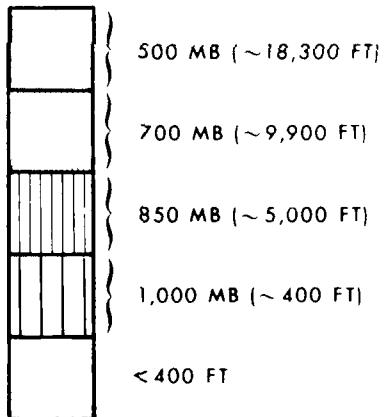
Mean Density (kg/m^3)
Std Dev < Dotted >
October
30 MS



**STANDARD DEVIATION OF HEIGHT
STANDARD DEVIATION OF VECTOR MEAN WIND
(13 LEVELS, 1000 TO 30 MB)**

- Contours of standard deviation of height (solid lines) in geopotential dekameters
- Standard deviation of height labeled interval:
 - 3 dekameters (30 meters) - 1000 MB to 400 MB
 - 6 dekameters (60 meters) - 300 MB to 200 MB
 - 4 dekameters (40 meters) - 150 MB to 30 MB
- Contours of standard deviation of vector mean wind (dashed lines) in knots
- Standard deviation of vector mean wind labeled interval: 5 knots
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE



Height (dkm) Std Dev <Solid>

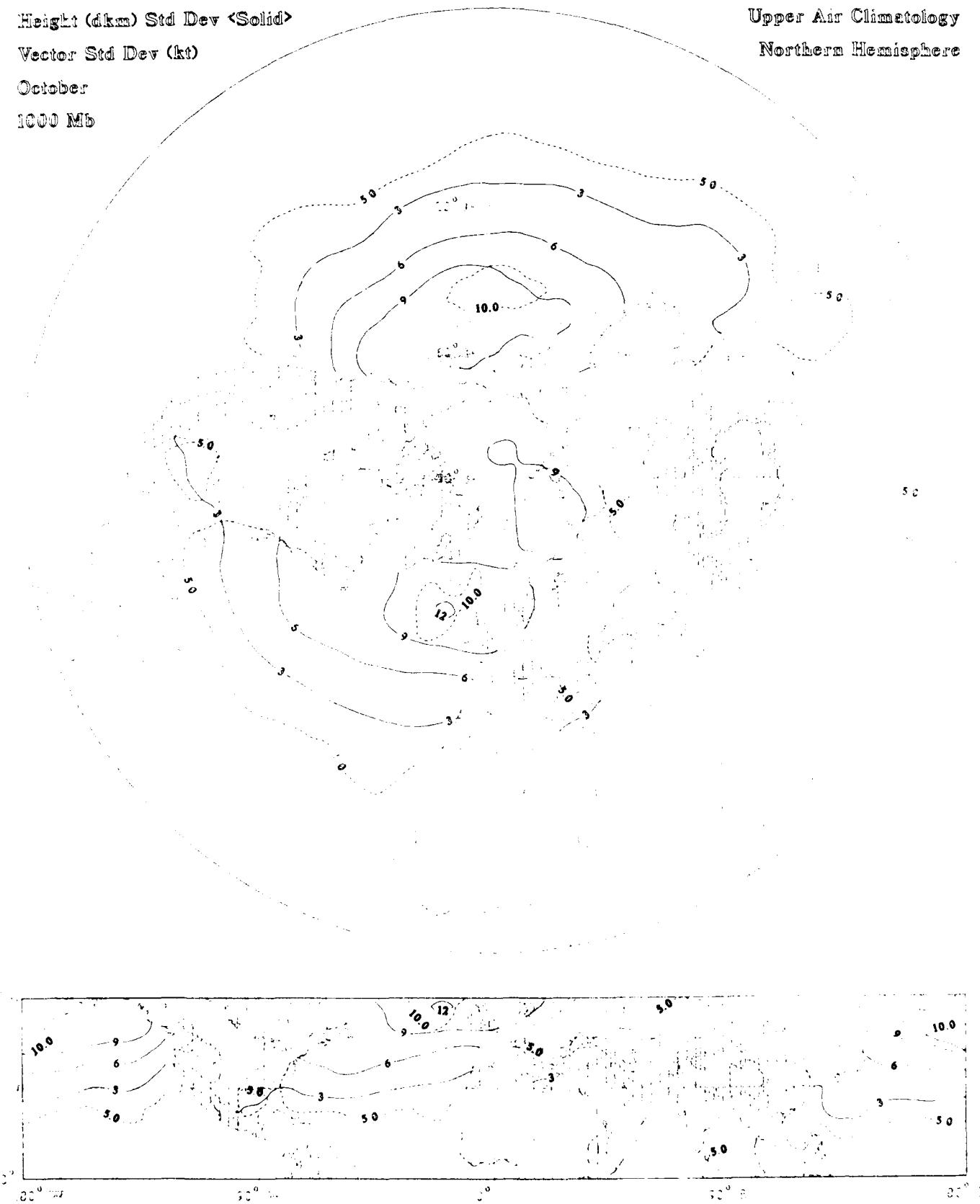
Vector Std Dev (kt)

October

1000 MB

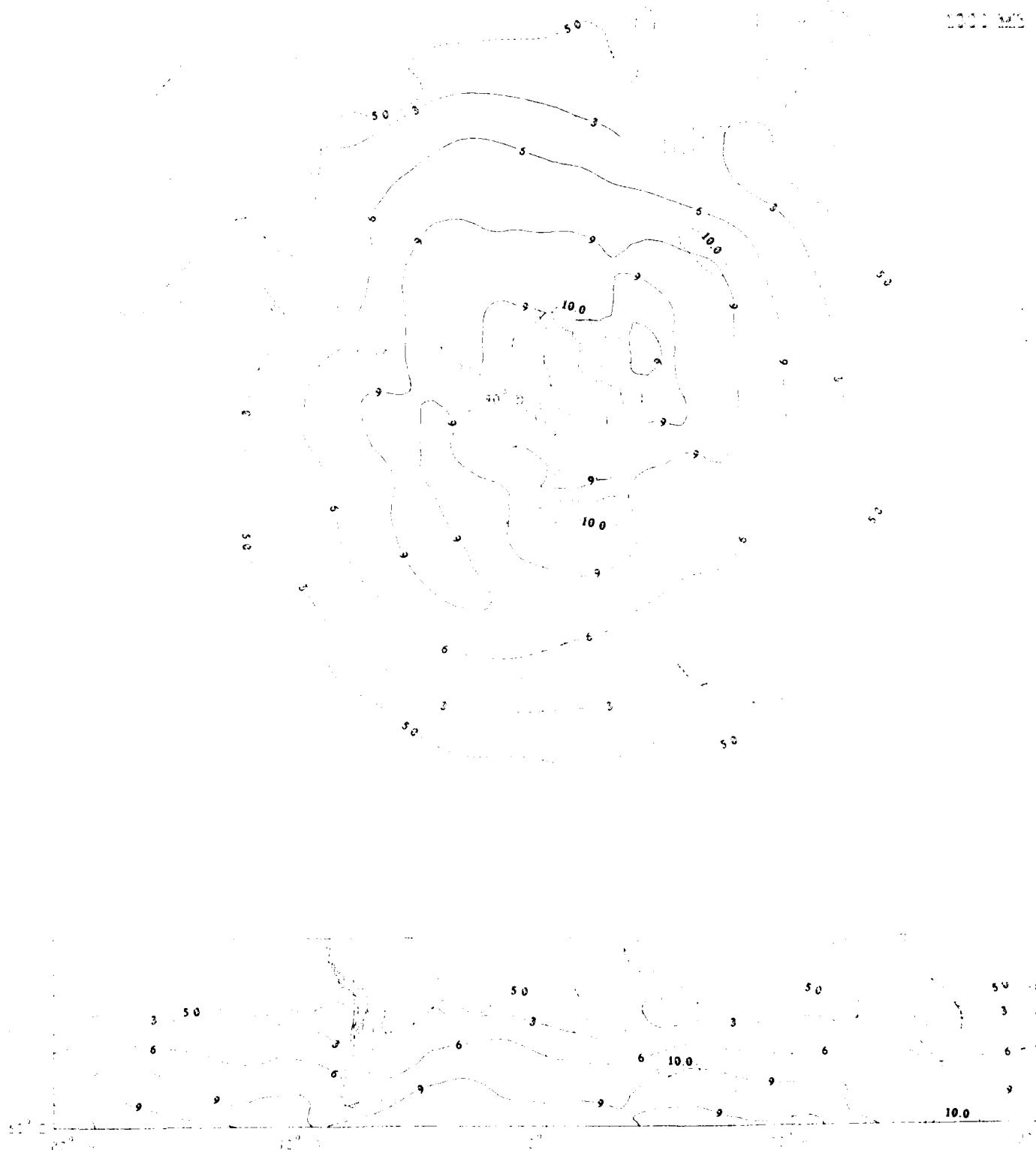
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev (Gcm)
Vector Std Dev (kt)
October
1971 M3



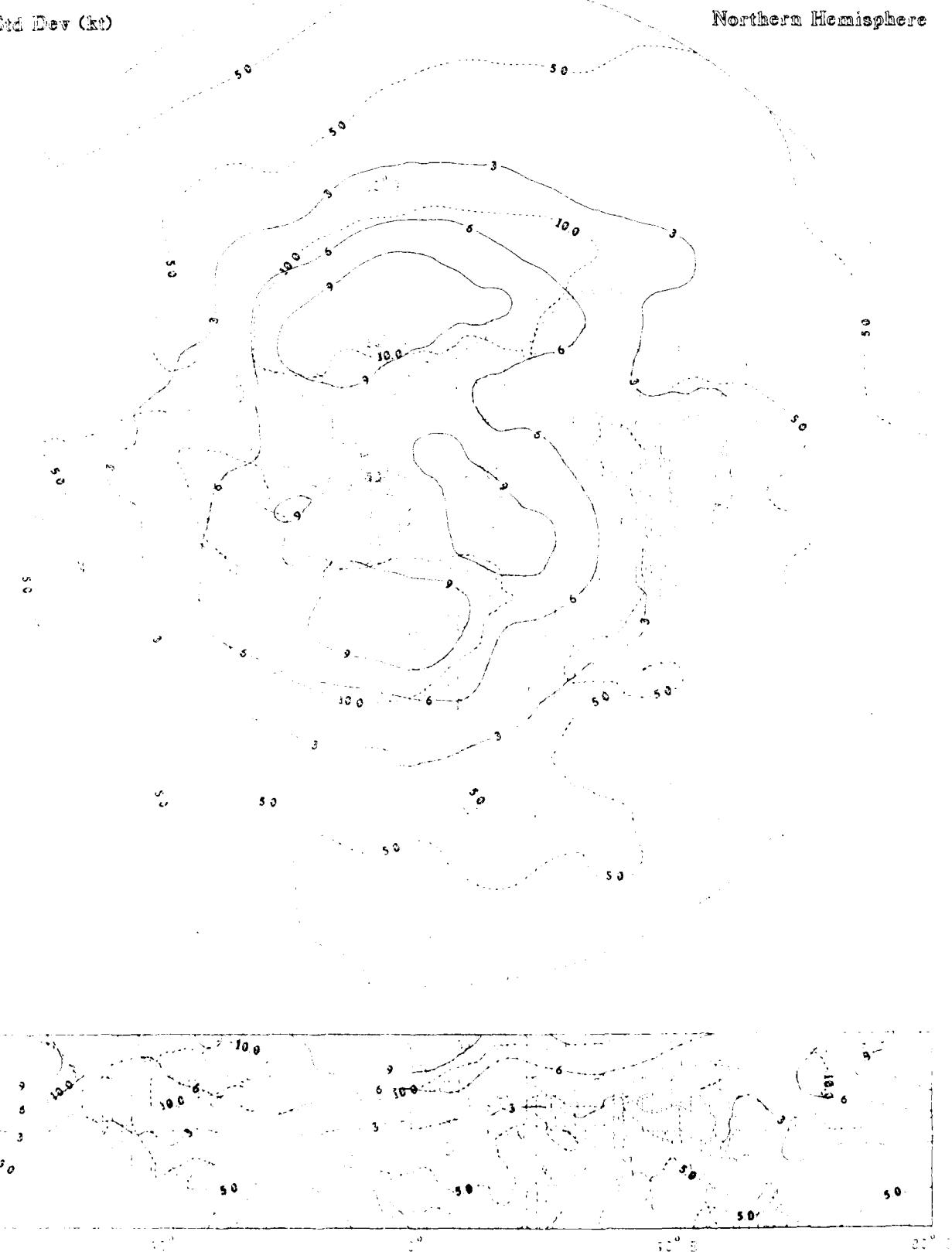
Height (dkm) Std Dev <Solid>

Vector Std Dev (kt)

October

981 MB

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology

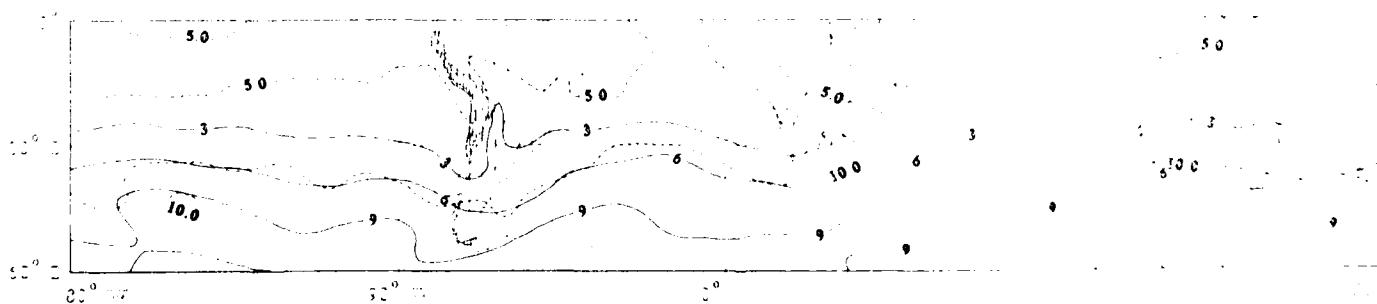
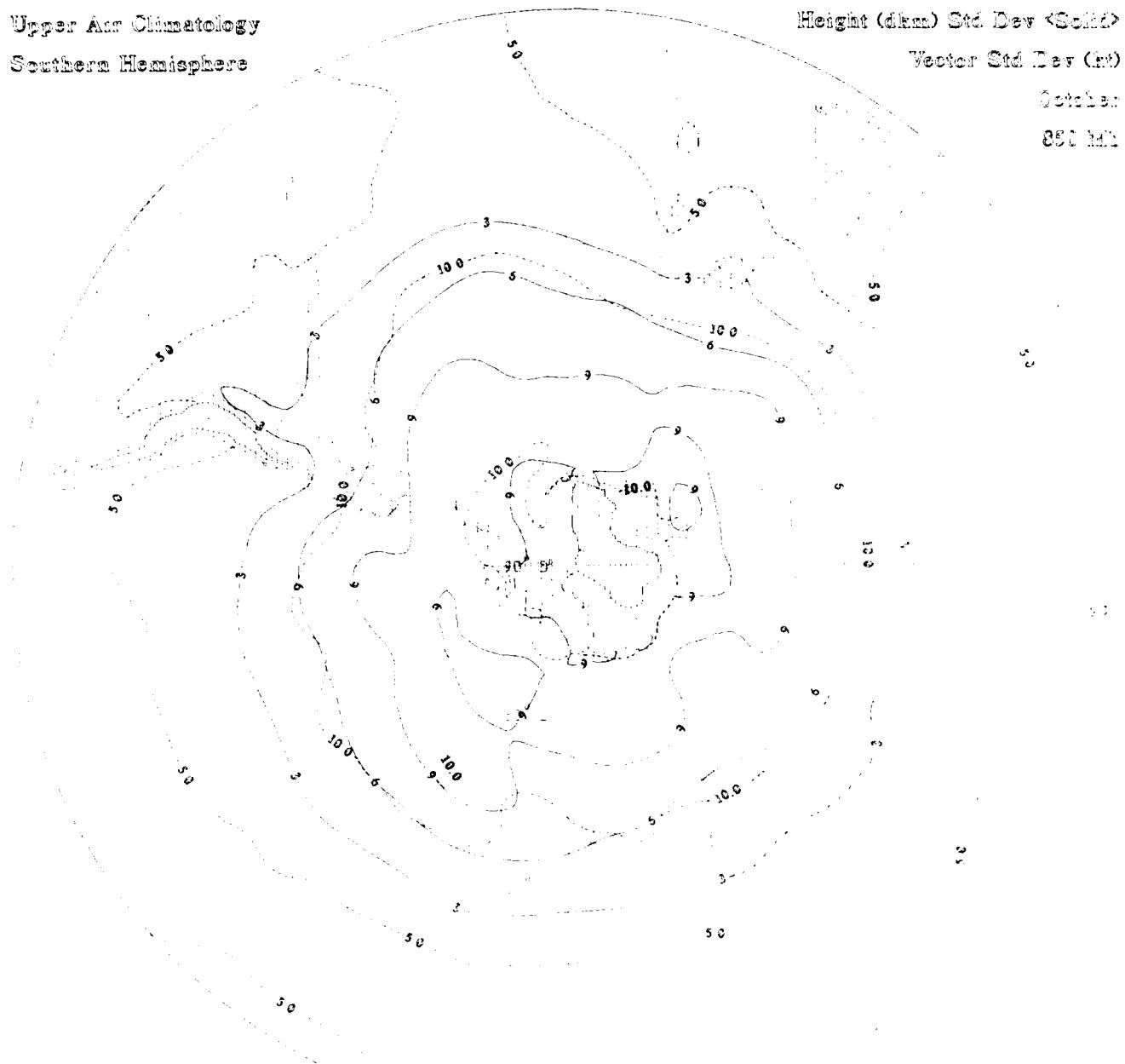
Southern Hemisphere

Height (dkm) Std Dev <Solid>

Vector Std Dev (kt)

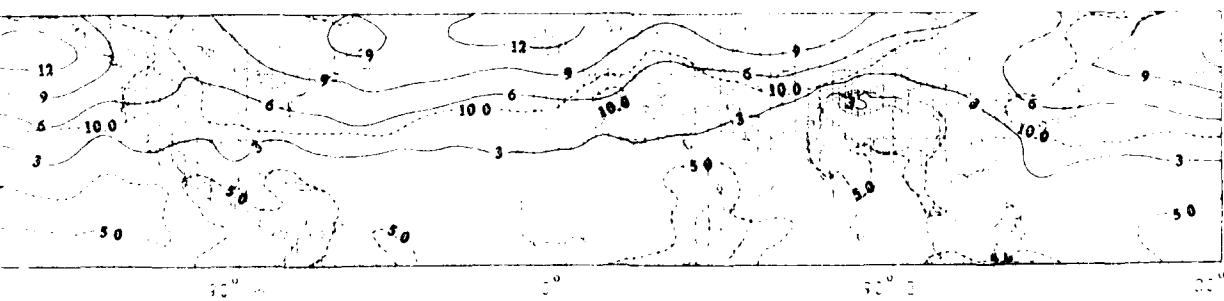
October

850 mb



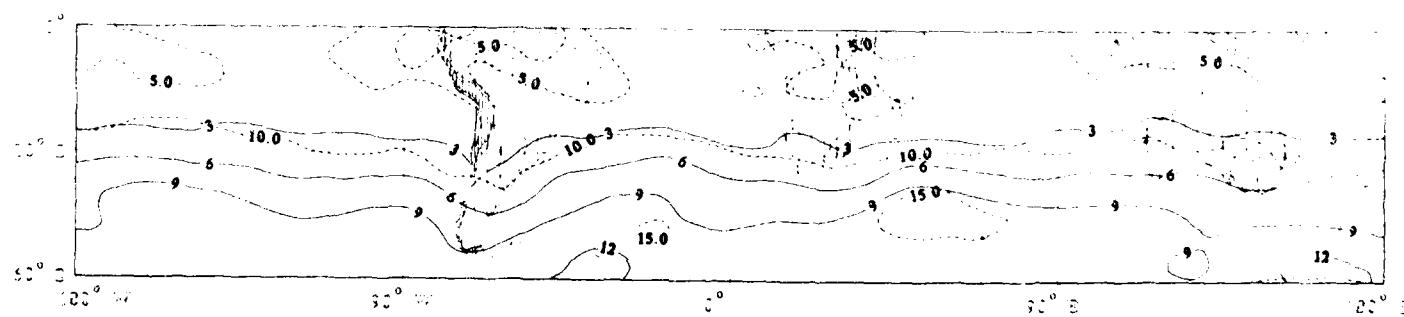
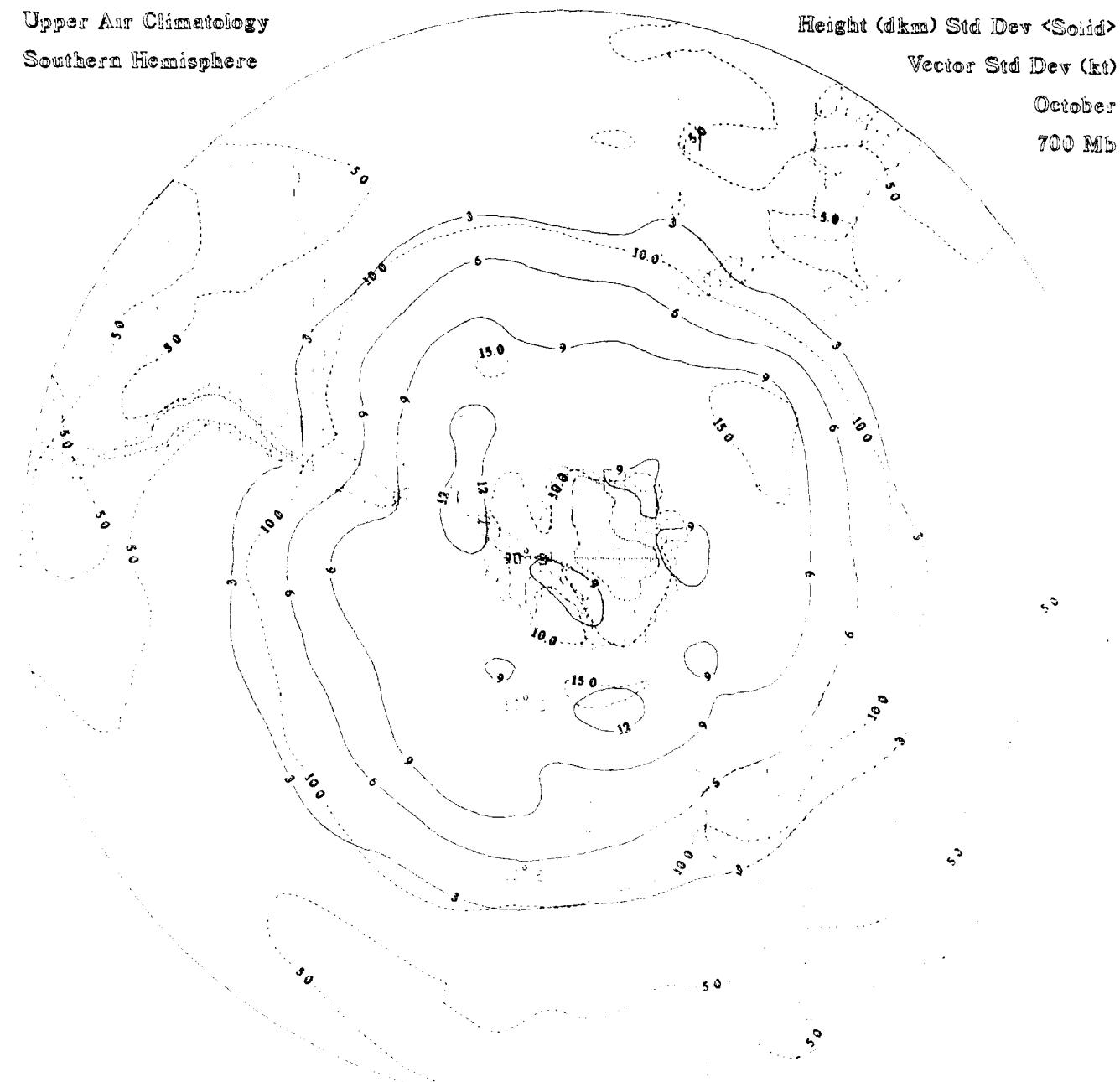
Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
700 Mb

Upper Air Climatology
Northern Hemisphere



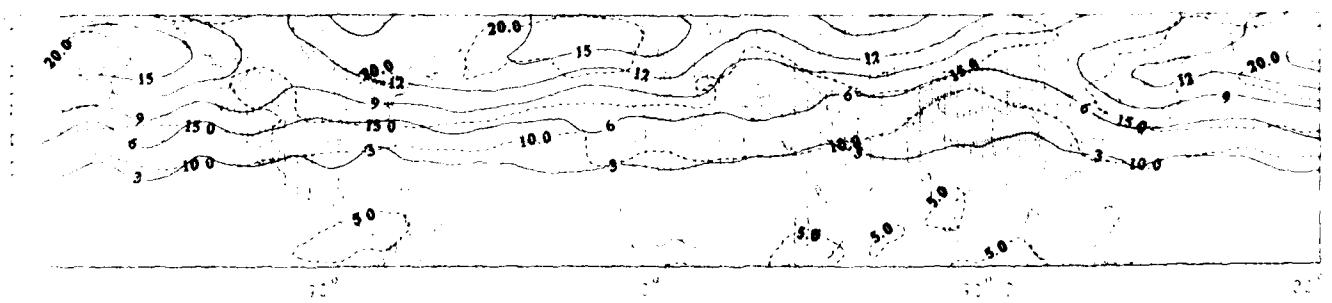
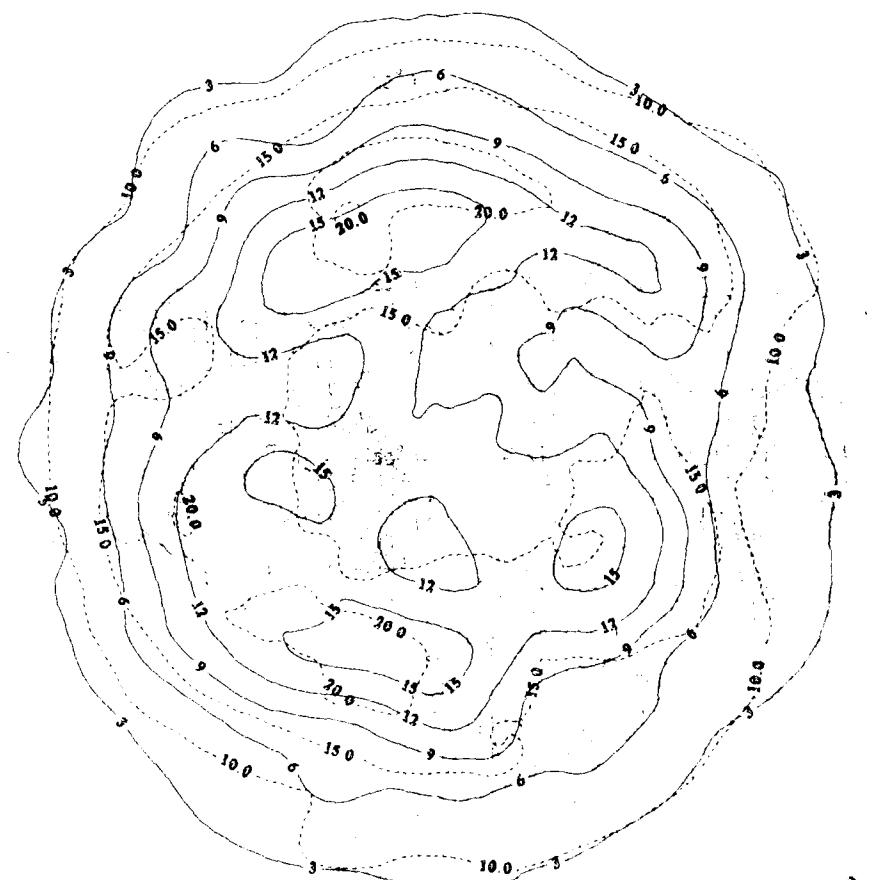
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (ft)
October
700 MB



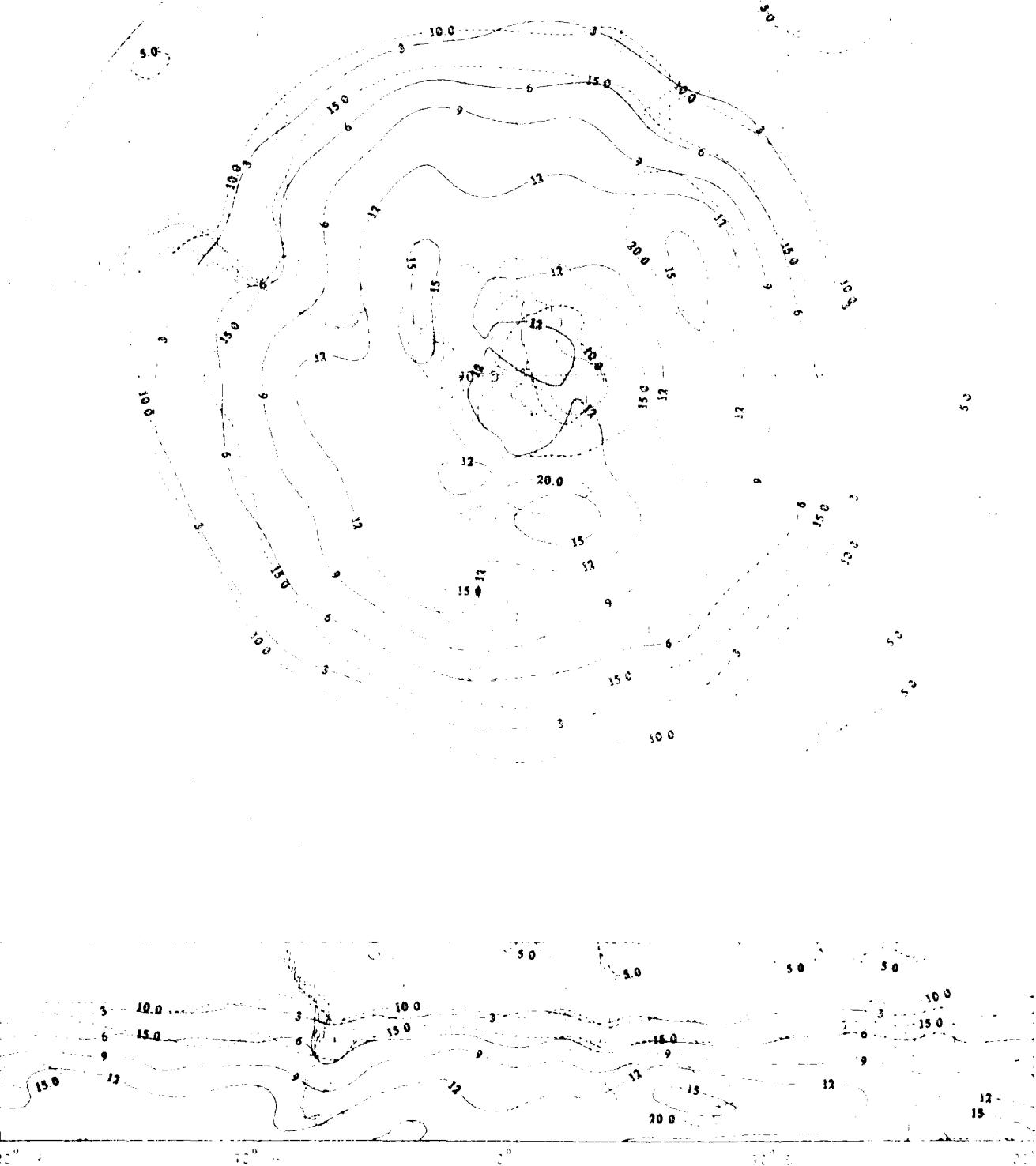
Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
500 MB

Upper Air Climatology
Northern Hemisphere



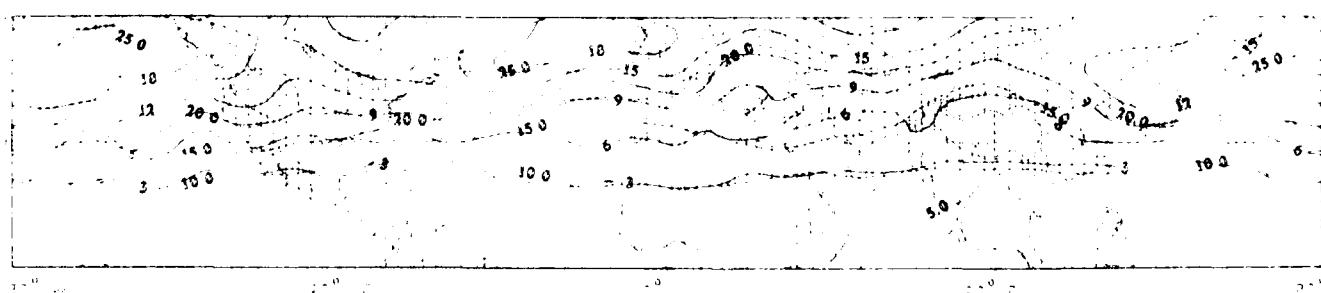
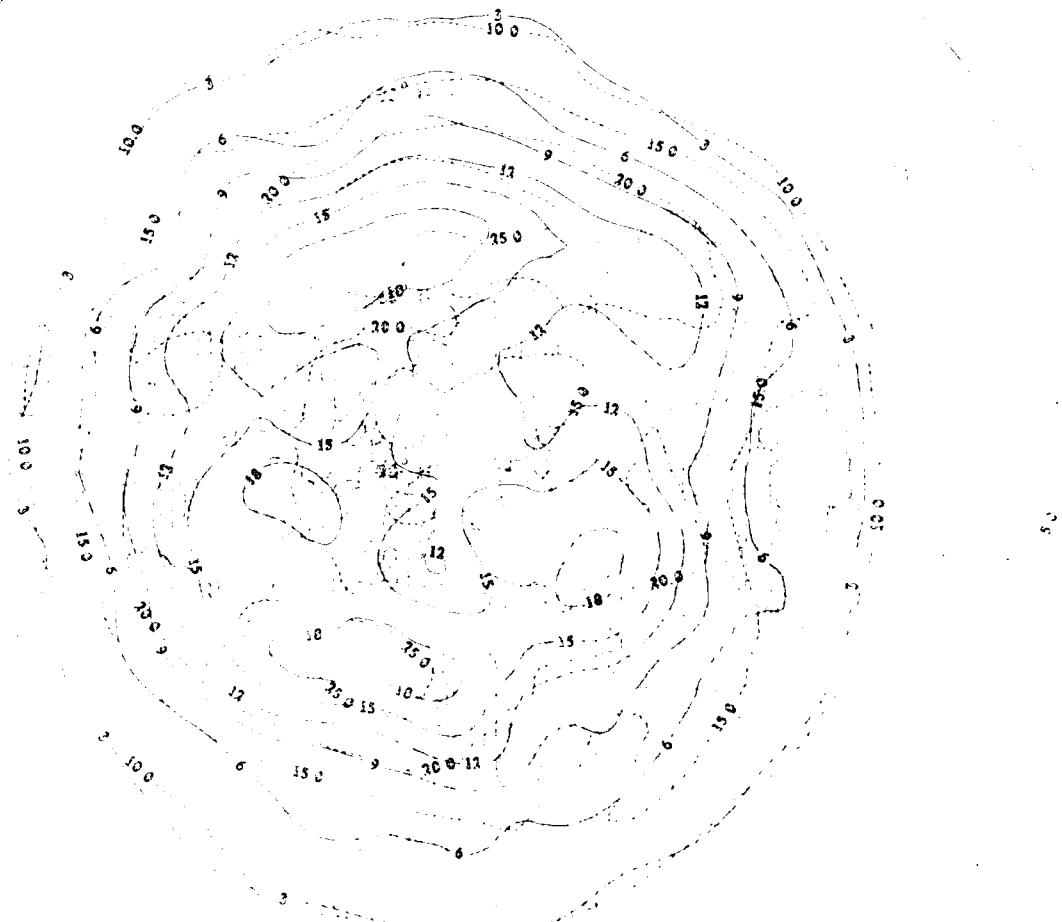
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
500 MB



Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
400 Mb

Upper Air Climatology
Northern Hemisphere



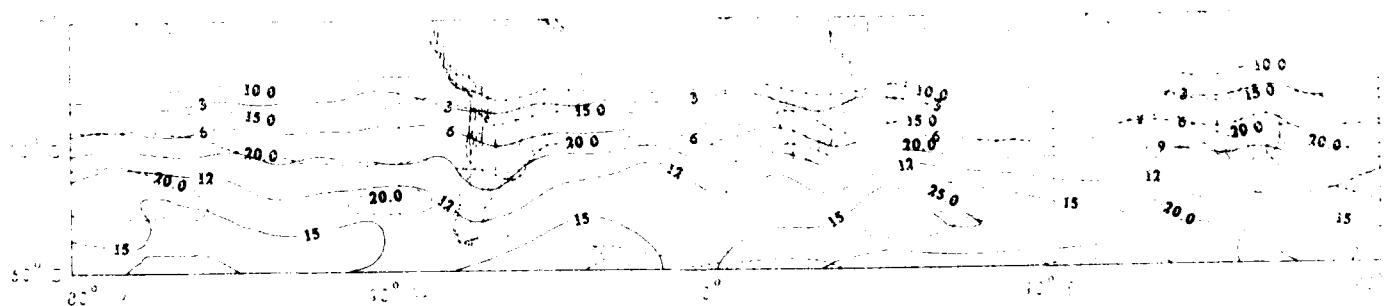
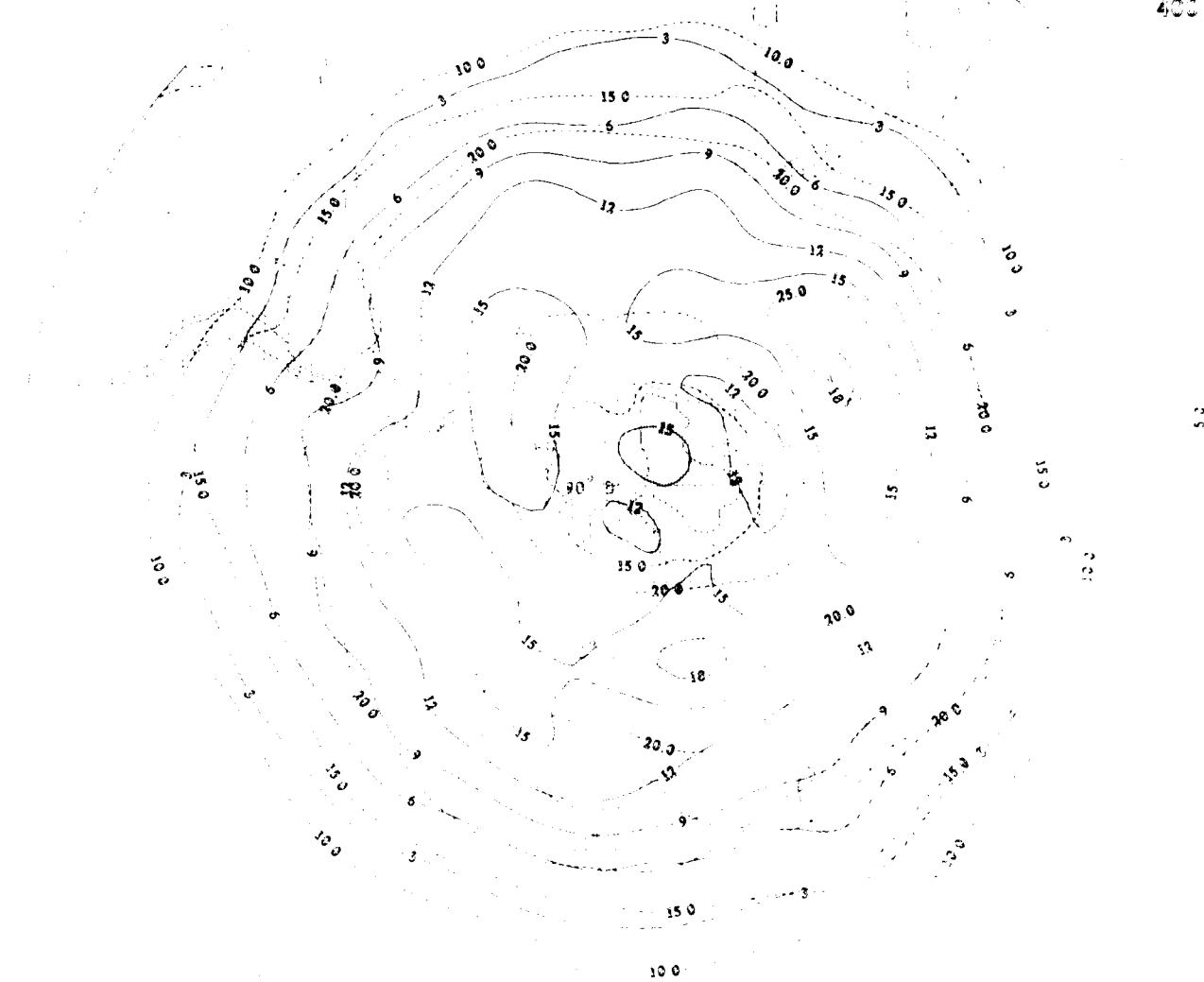
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>

Vector Std Dev (kt)

October

400 MB



Height (dkm) Std Dev <Solid>

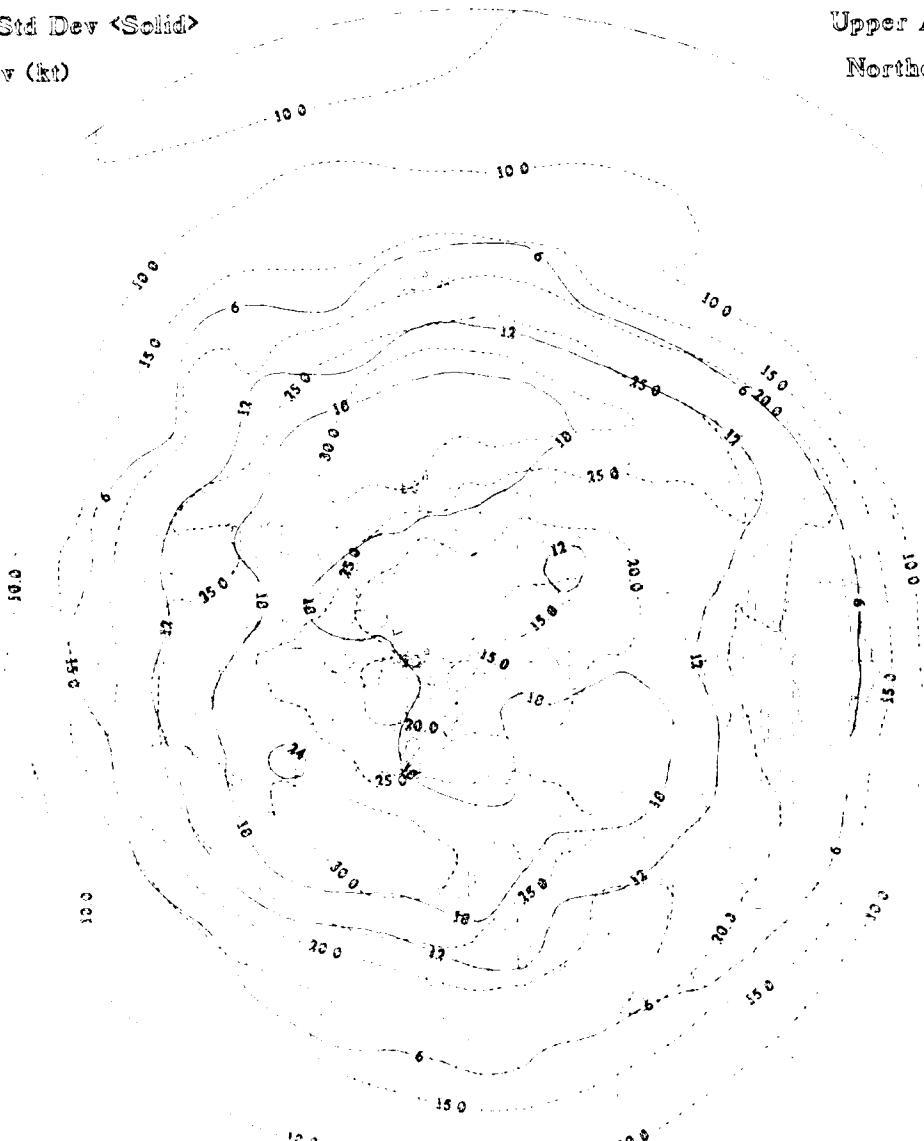
Vector Std Dev (kt)

October

90J MS

Upper Air Climatology

Northern Hemisphere



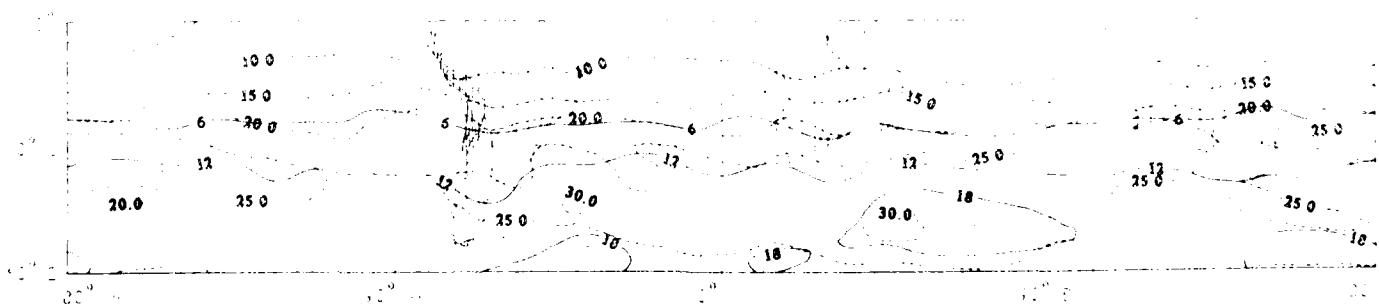
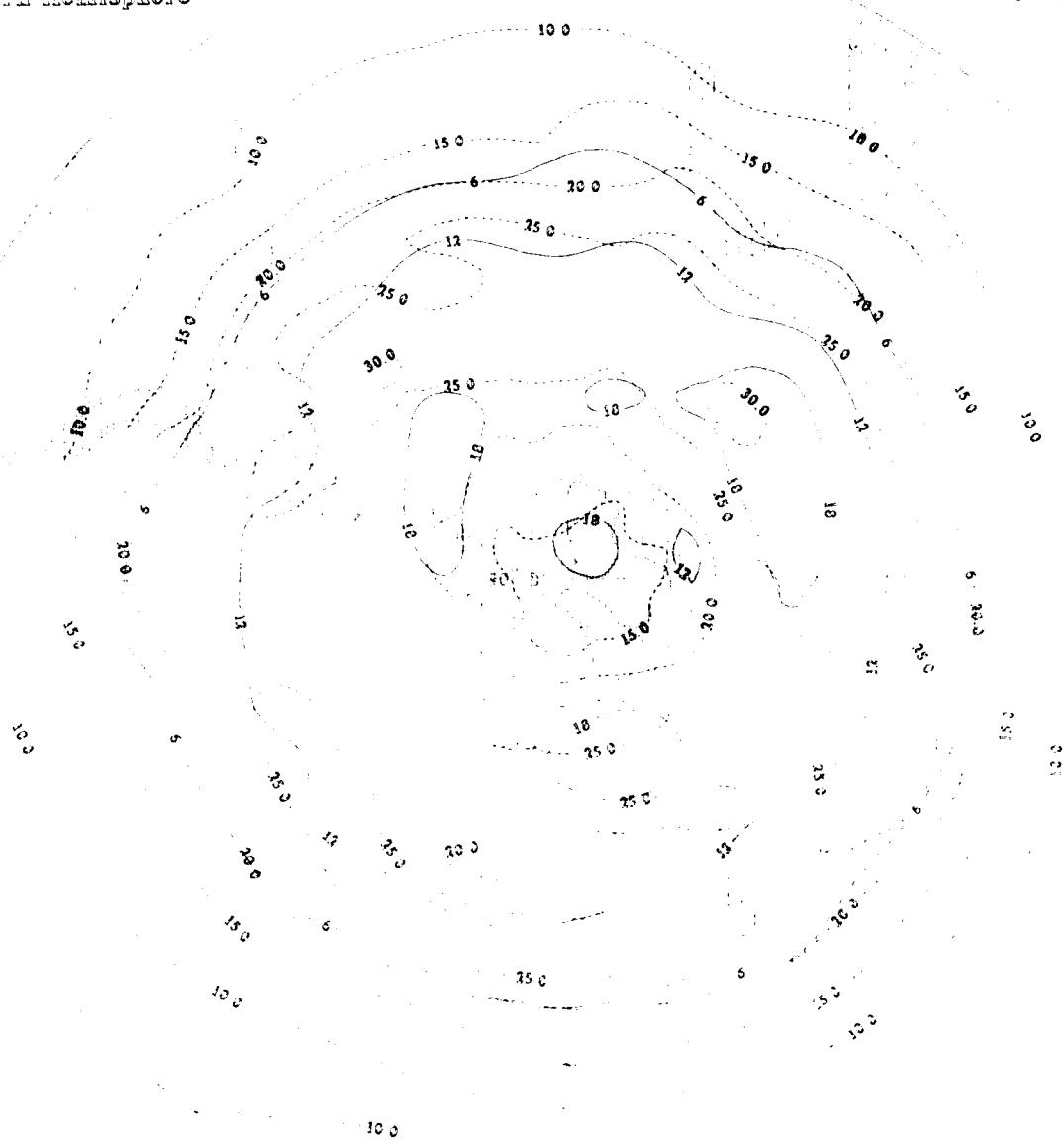
Upper Air Climatology
Southern Hemisphere

Height (ckm) Std Dev <Solid>

Vector Std Dev (kt)

October

300 MB



Height (dkm) Std Dev <Solid>

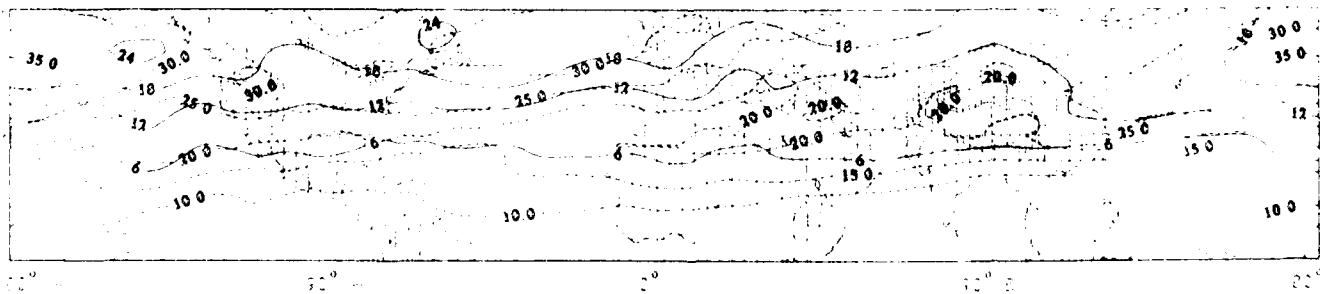
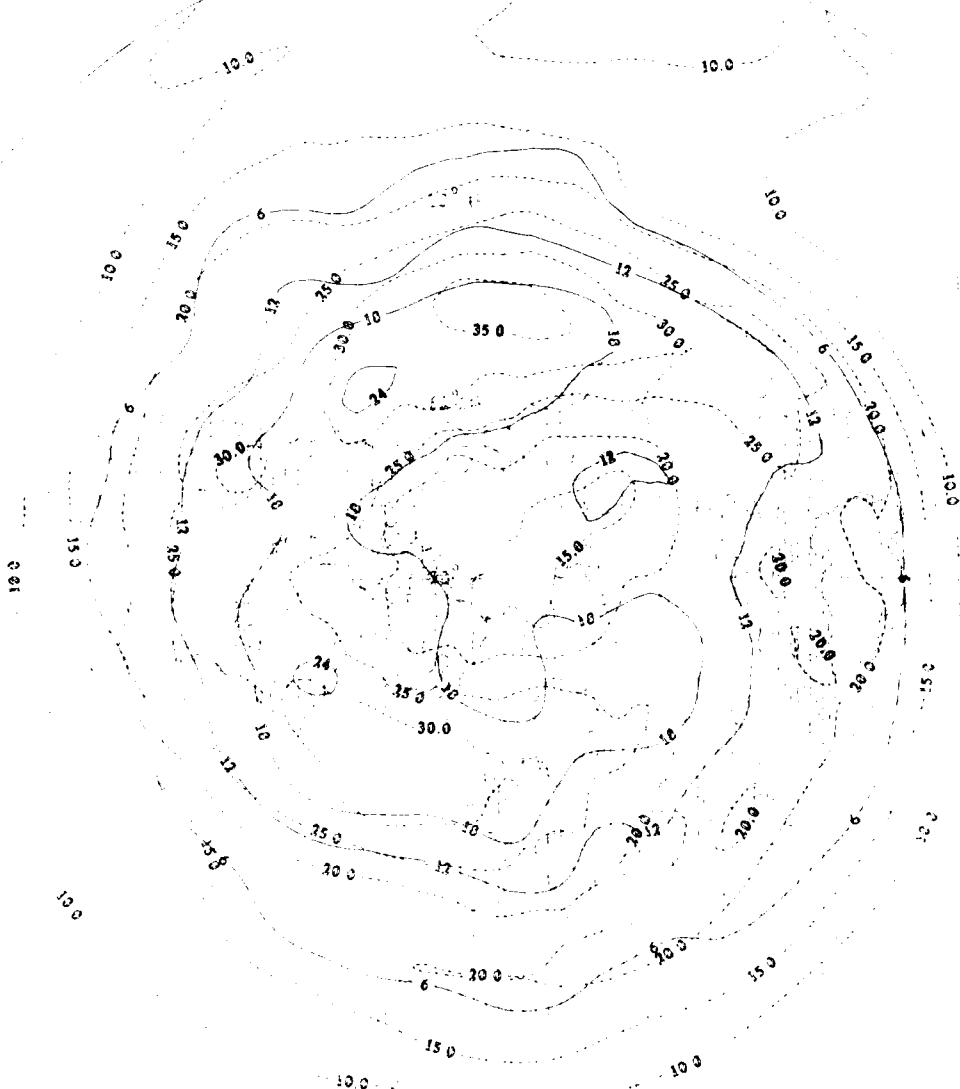
Vector Std Dev (kt)

October

250 MB

Upper Air Climatology

Northern Hemisphere



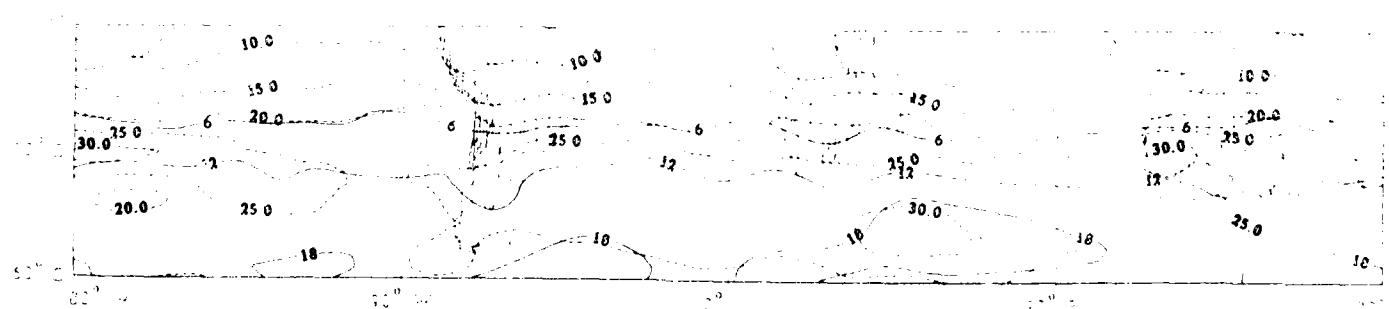
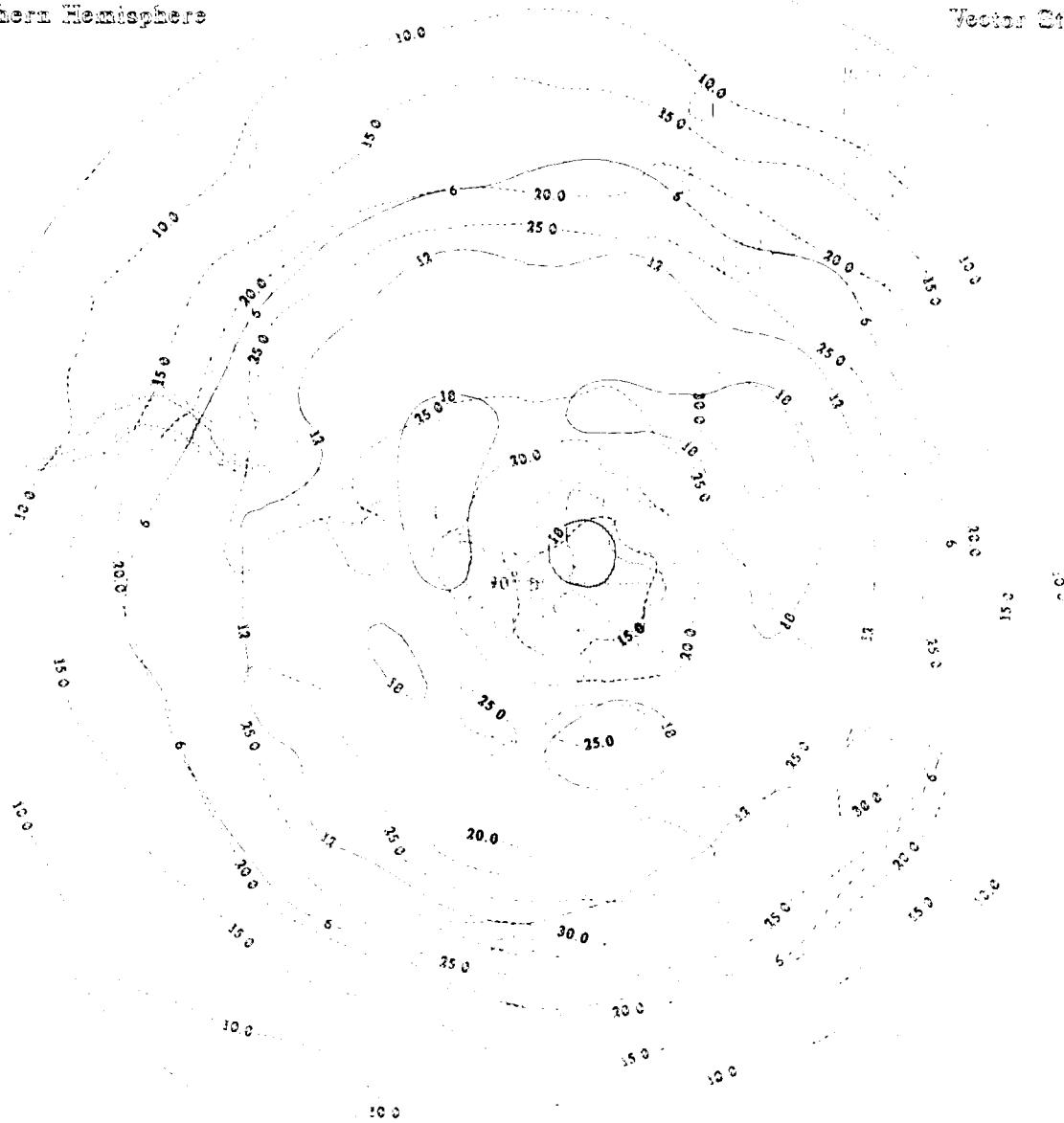
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Godd>

Vector Std Dev (ft)

October

250 mb



Height (diam) Std Dev <Solid>

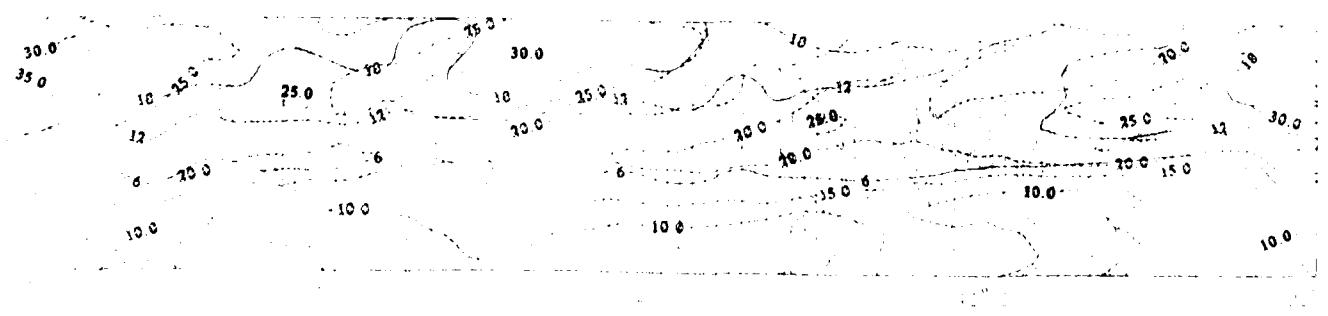
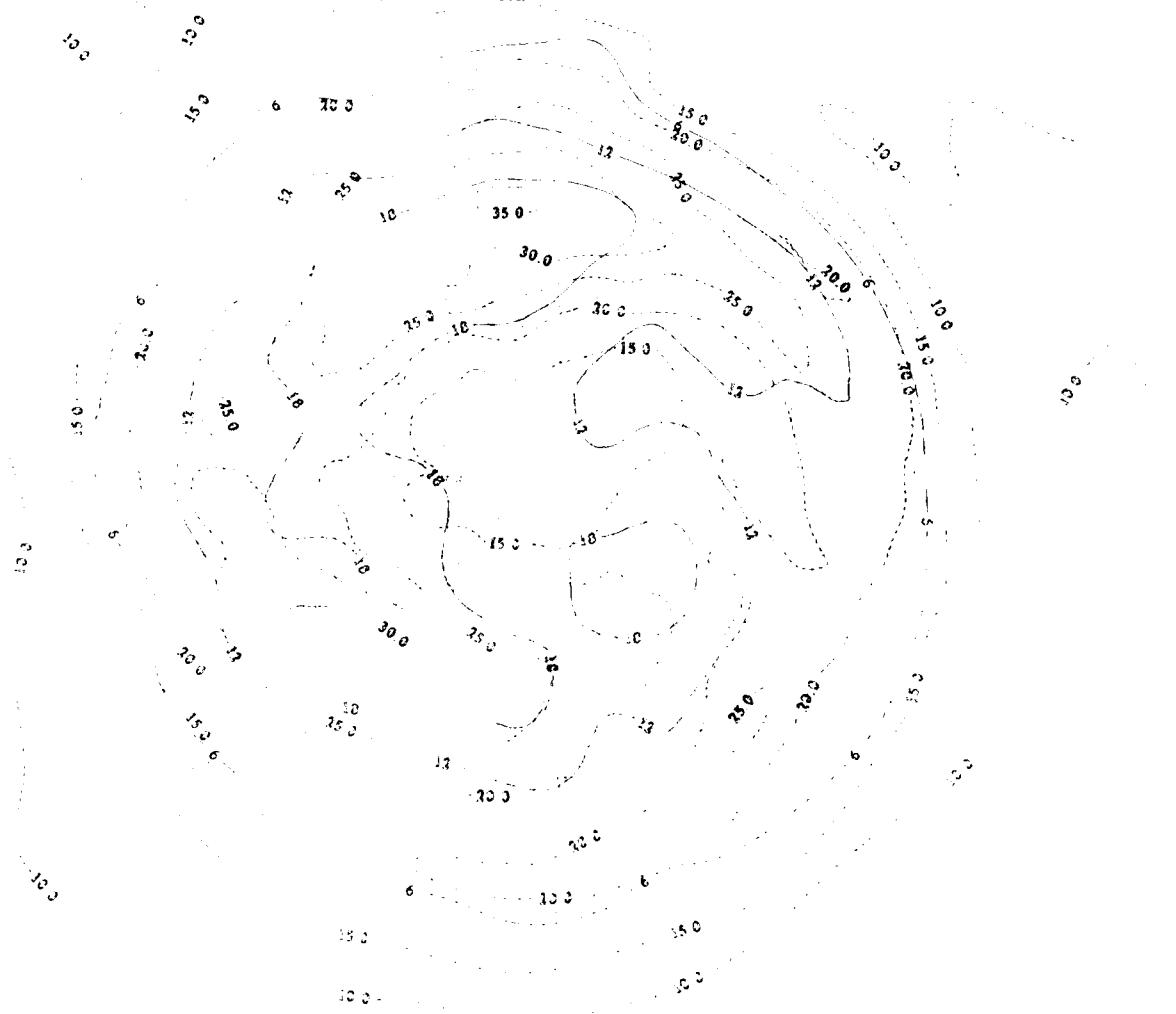
Vector Std Dev (km)

October

200 MB

Upper Air Climatology

Northern Hemisphere



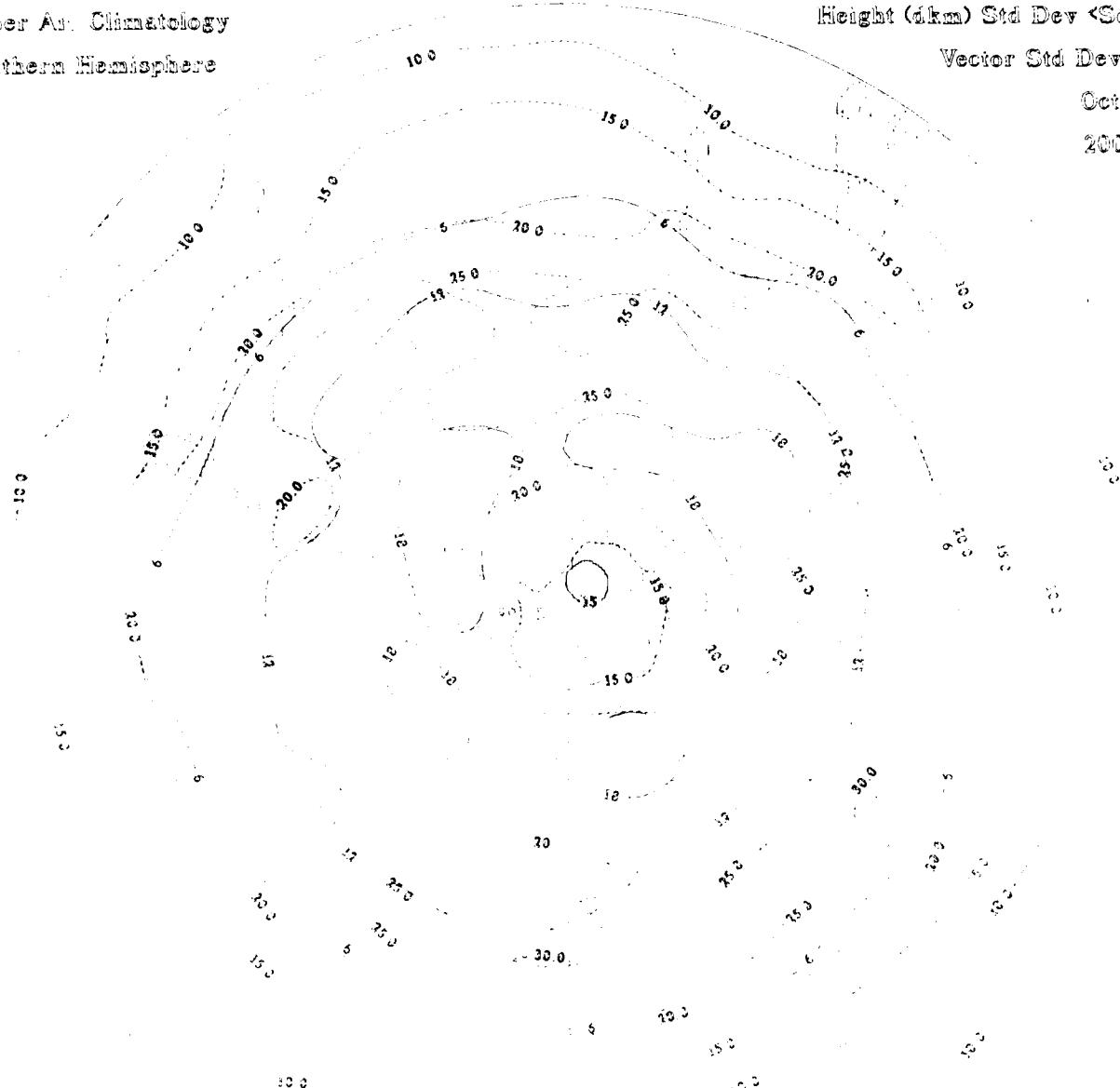
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>

Vector Std Dev (ft)

October

200 MB



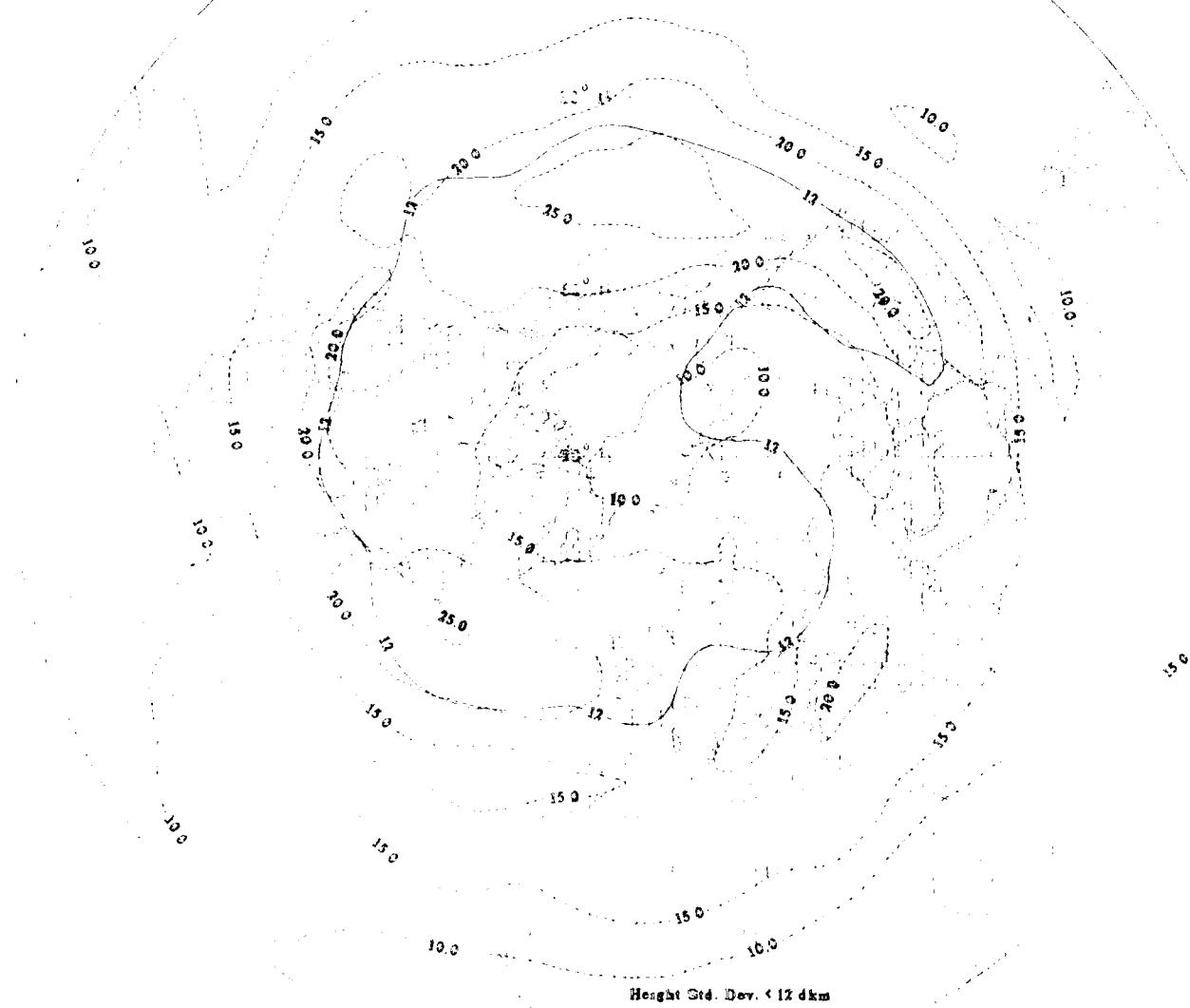
Height (dkm) Std Dev < Solid>

Vector Std Dev (ft)

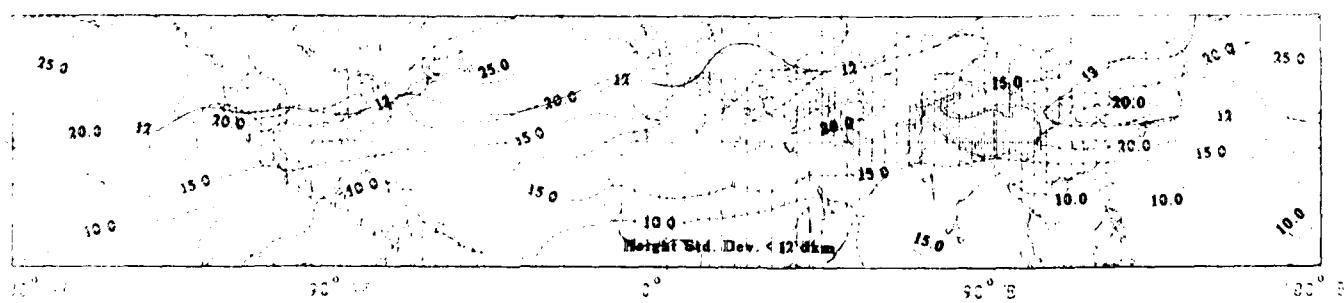
October

150 Mb

Upper Air Climatology
Northern Hemisphere



Height Std. Dev. < 12 dkm



Height Std. Dev. < 12 dkm

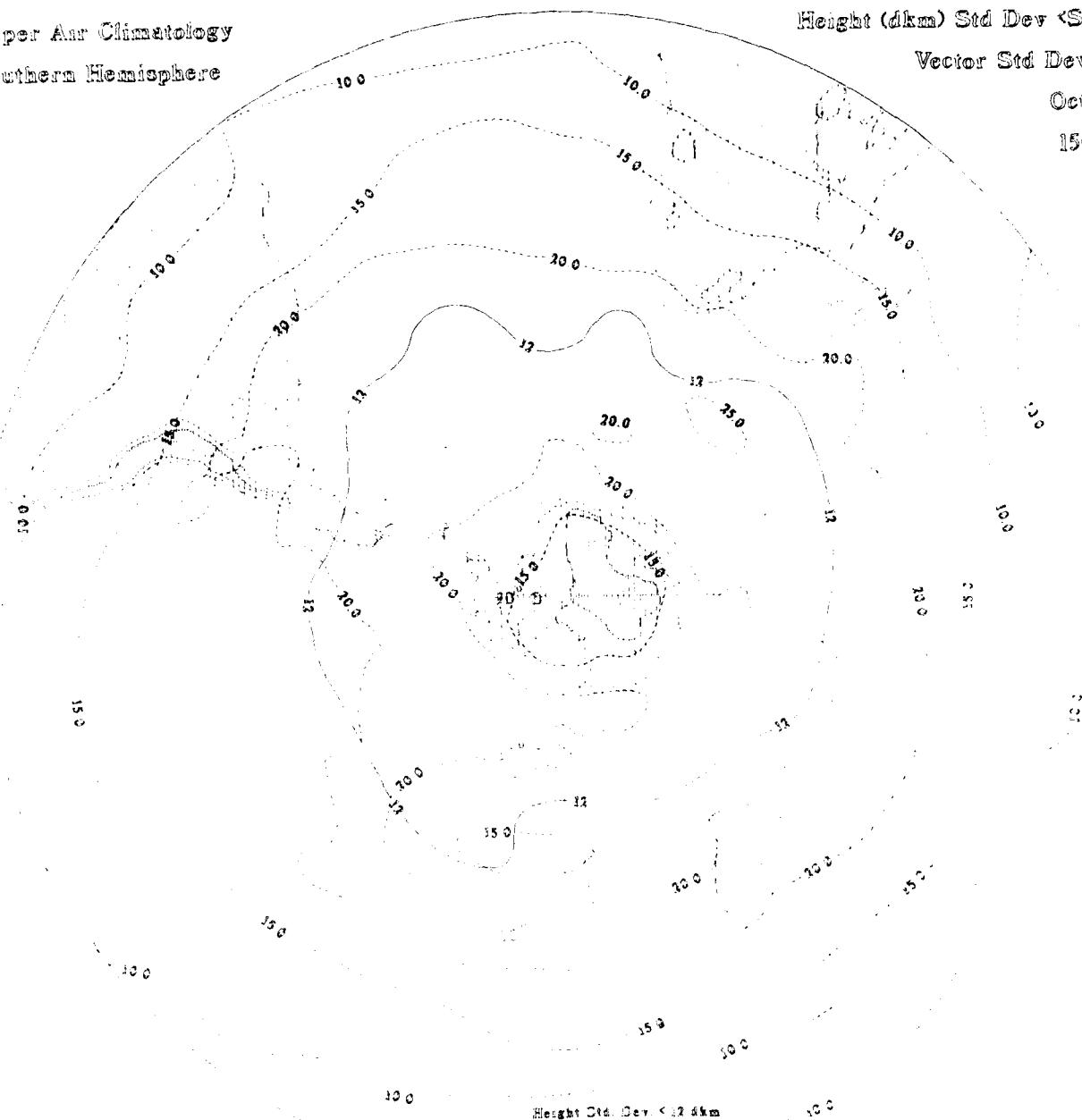
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>

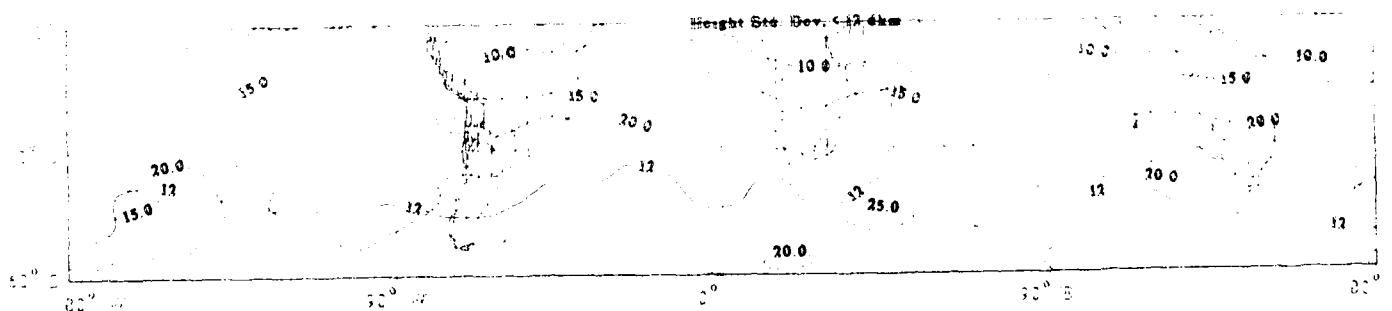
Vector Std Dev (kt)

October

150 MB



Height Std. Dev. < .2 dkm



Height (dkm) Std Dev < Solid>

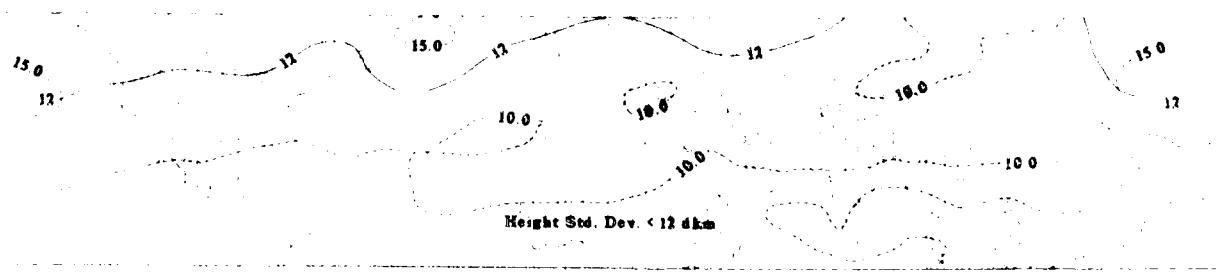
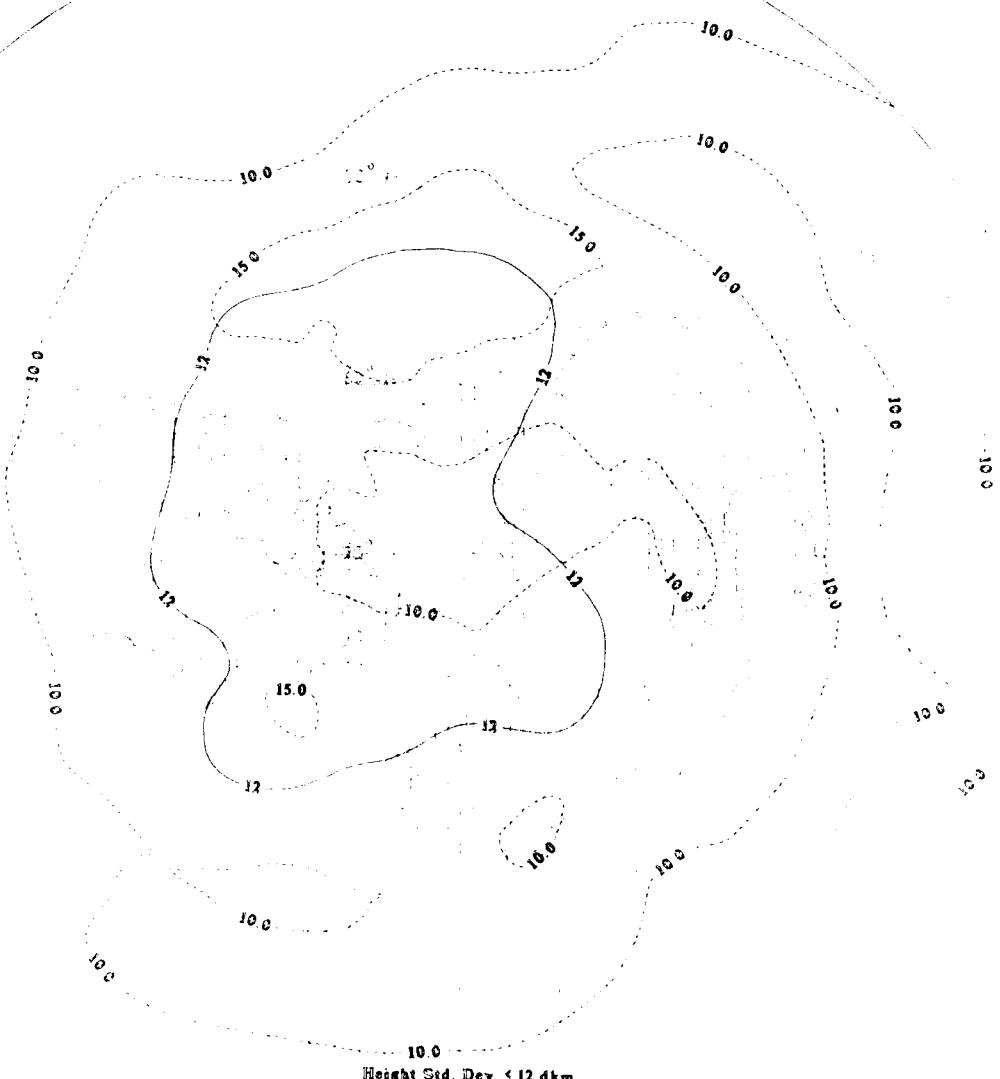
Vector Std Dev (kt)

October

100 Mb

Upper Air Climatology

Northern Hemisphere



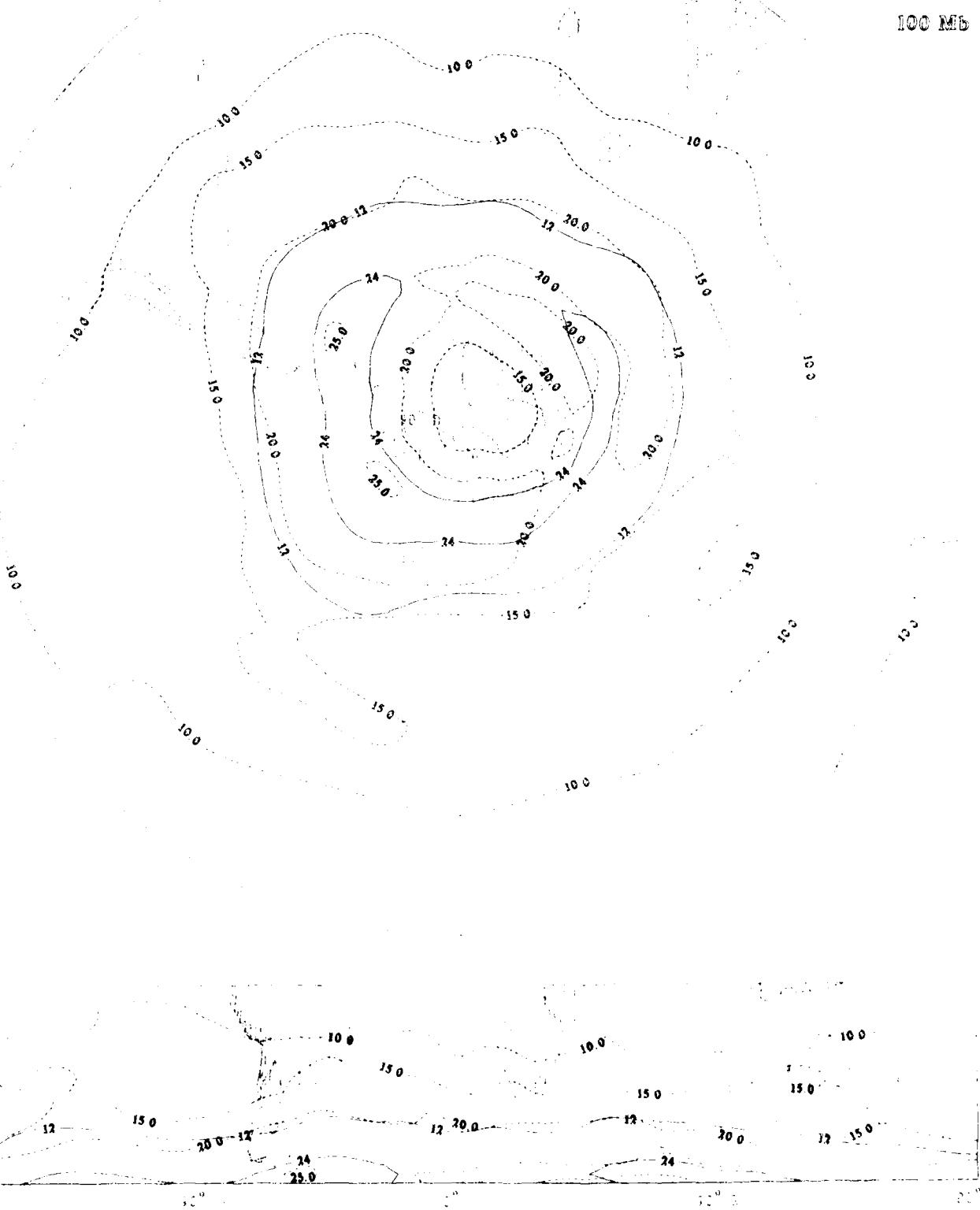
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>

Vector Std Dev (kt)

October

100 Mb



Height (dkm) Std Dev < Solid>

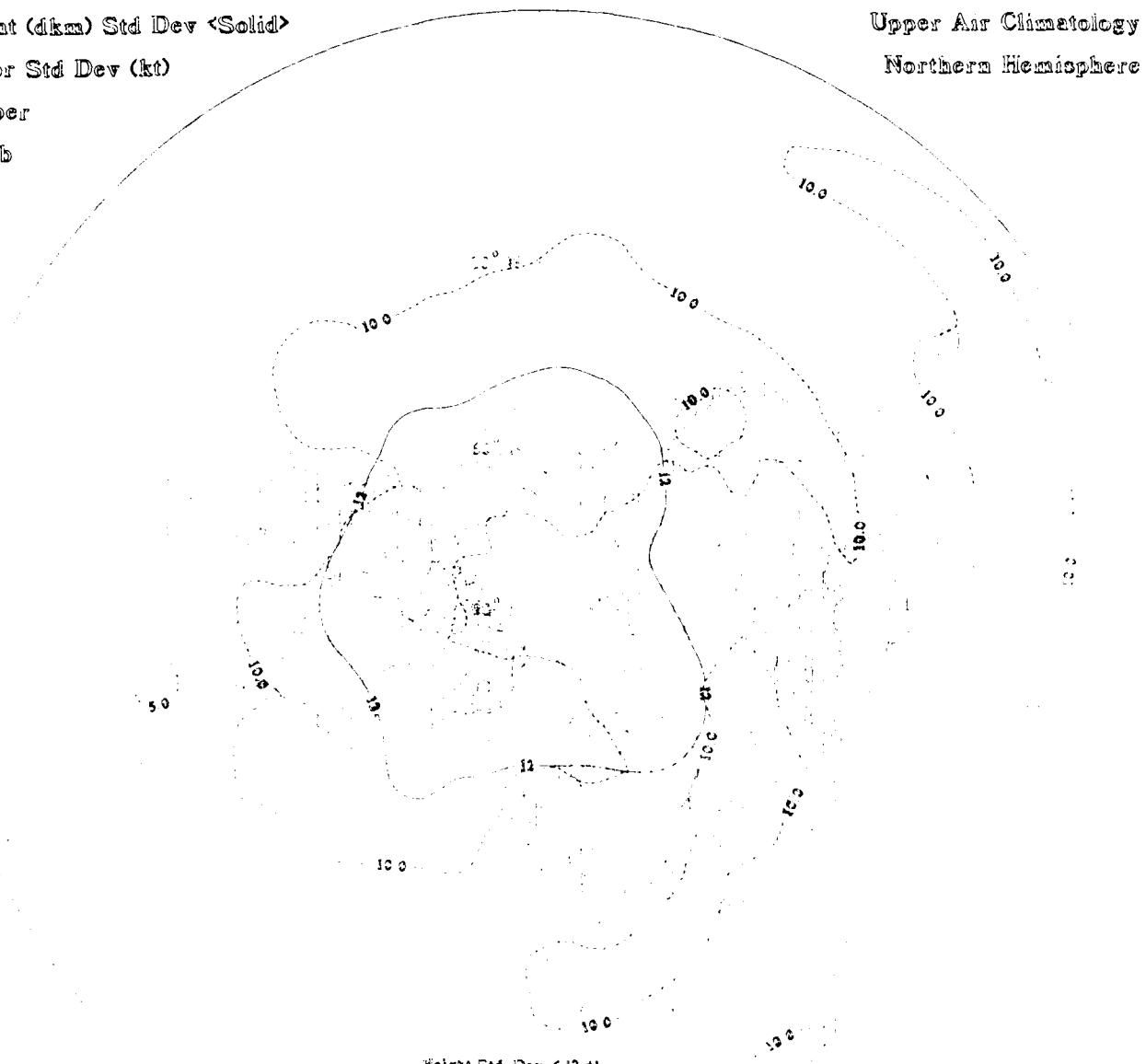
Vector Std Dev (kt)

October

70 Mb

Upper Air Climatology

Northern Hemisphere



Height Std. Dev. < 12 dkm

12

5.0

Height Std. Dev. < 12 dkm

10.0

10.0

10.0

10.0

55° N

50° N

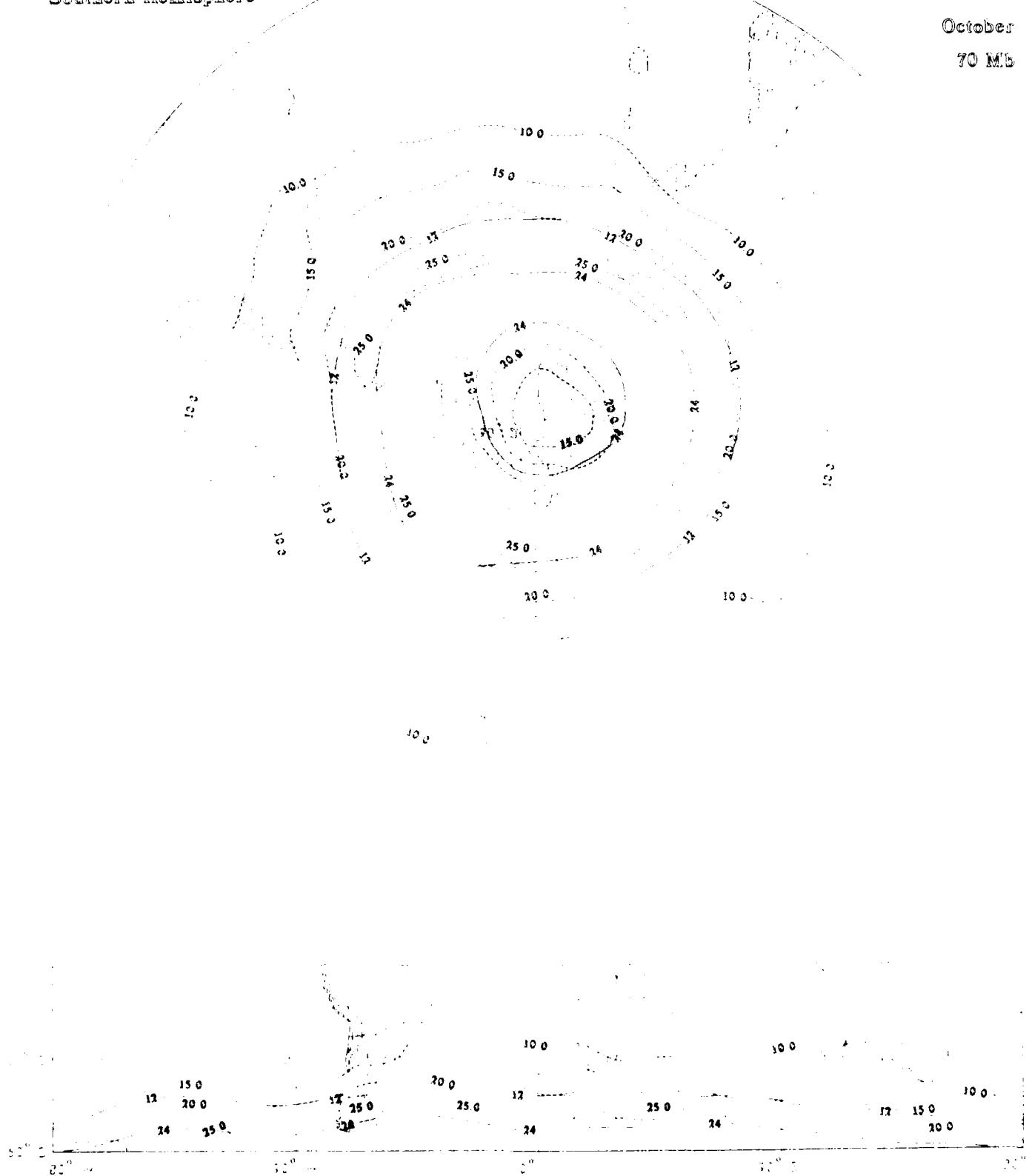
45°

35° S

30°

Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
70 Mb



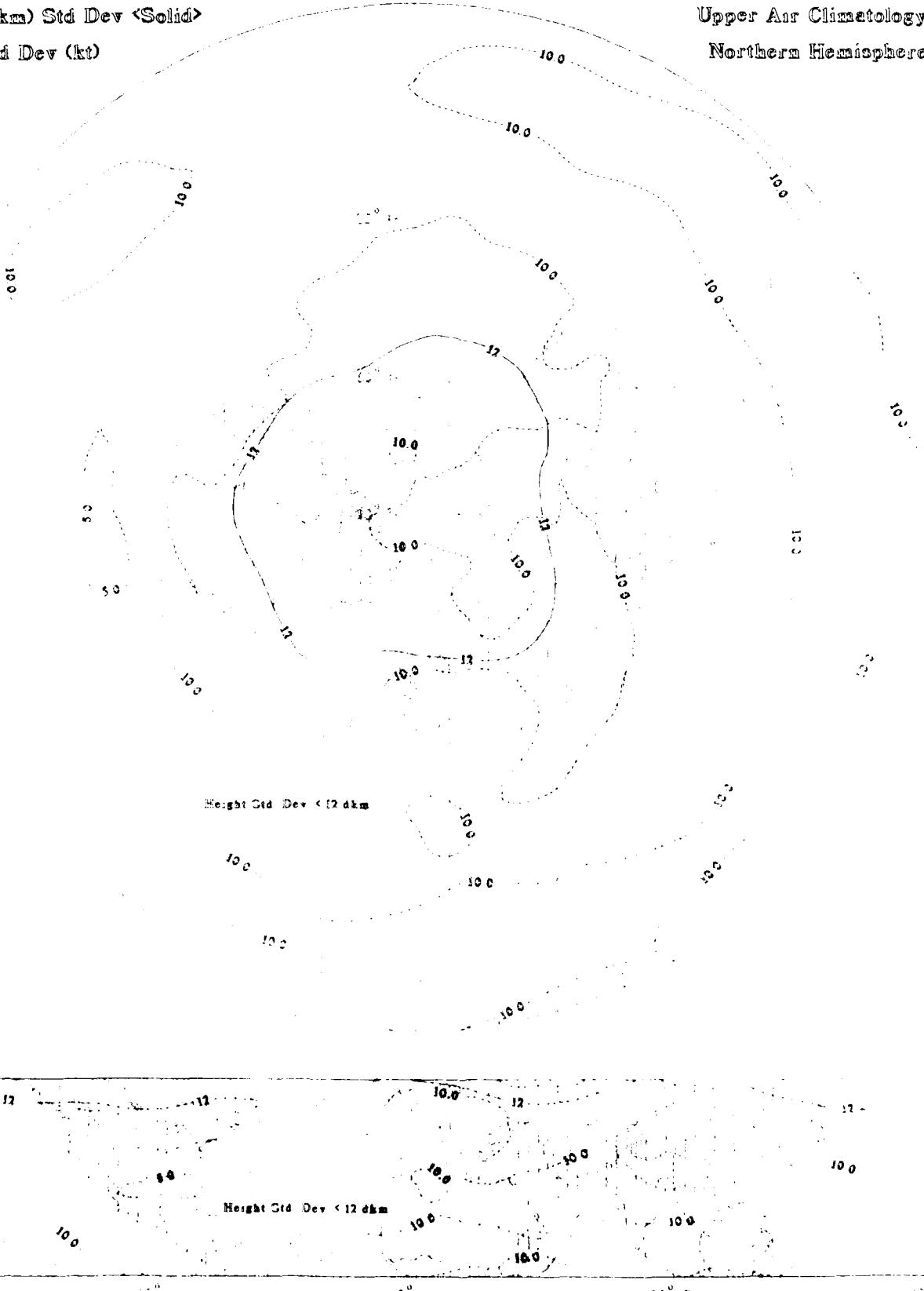
Height (dkm) Std Dev < Solid>

Vector Std Dev (kt)

October

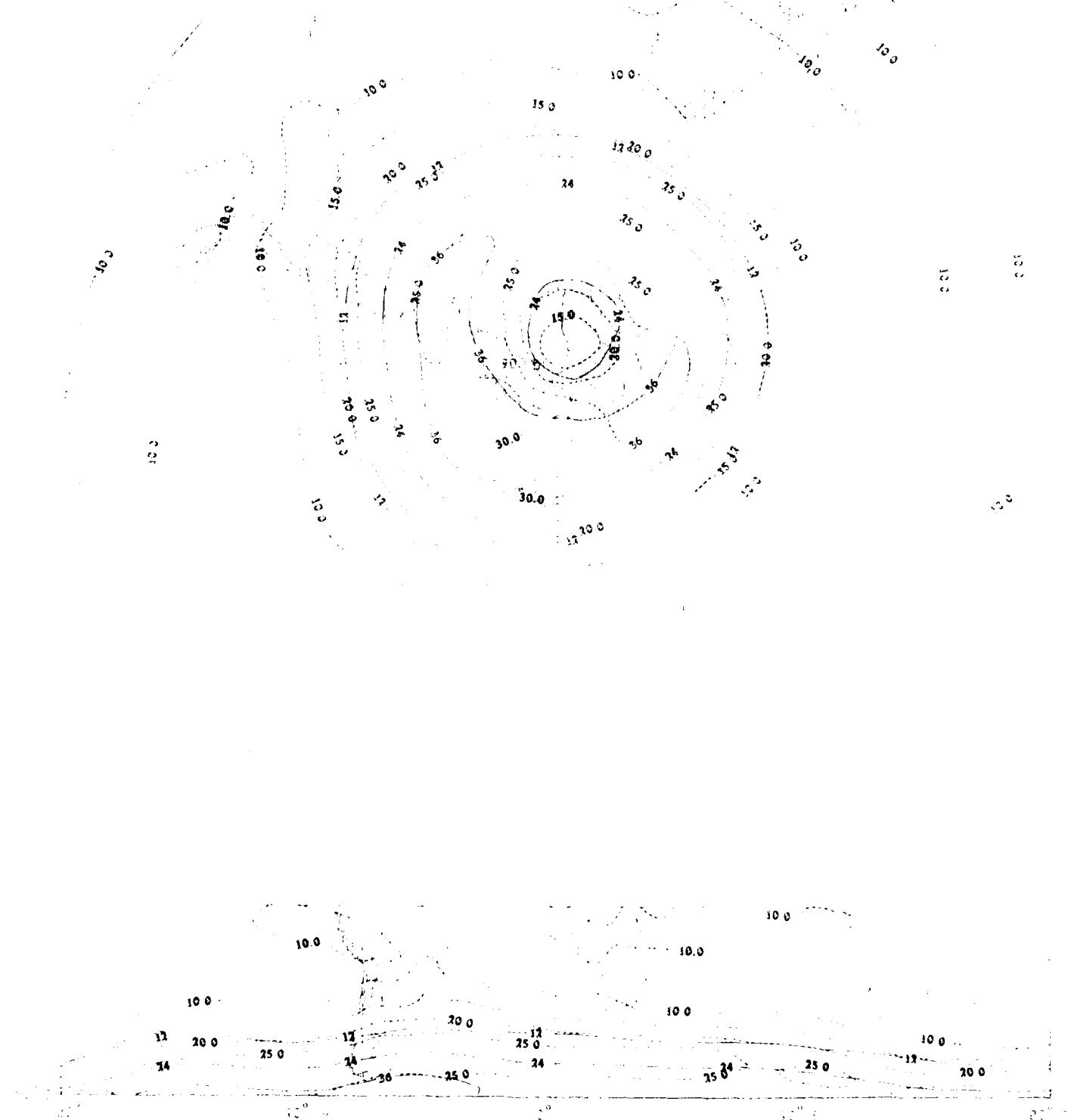
50 Mb

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (ft)
October
50 MIL



Height (dkm) Std Dev <Solid>

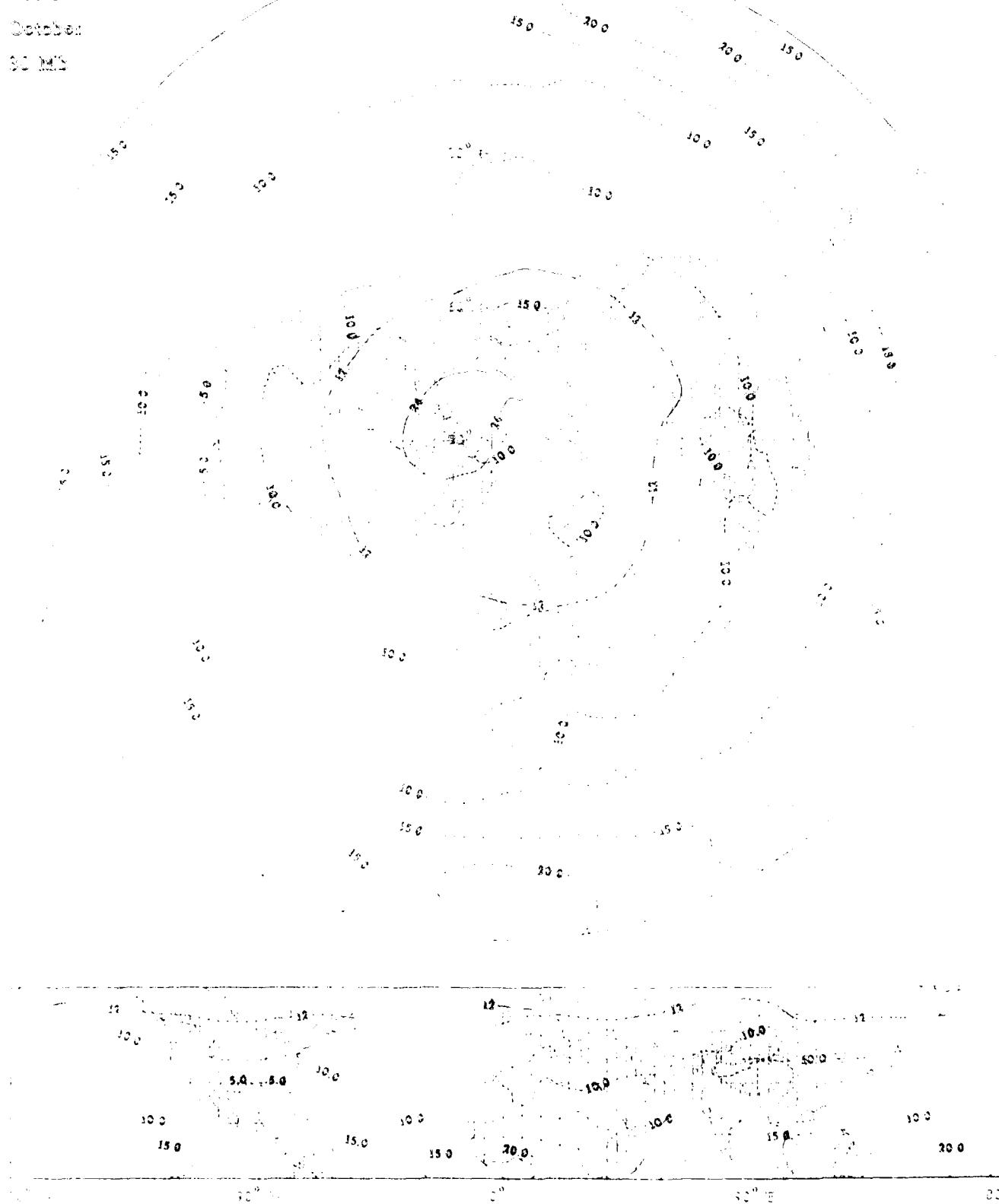
Vector Std Dev (km)

October

30 MIS

Upper Air Climatology

Northern Hemisphere

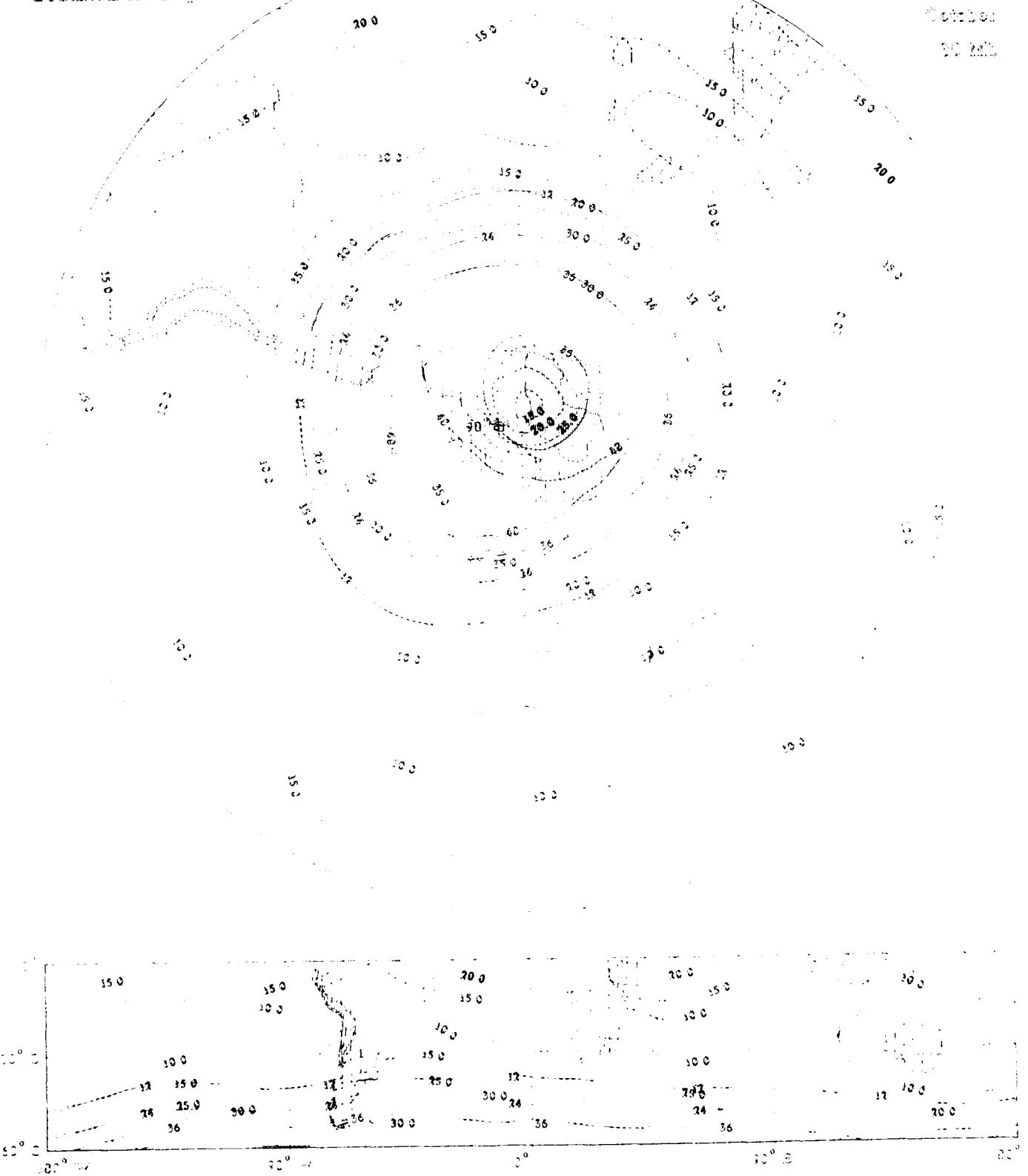


Upper Air Climatology
Northern Hemisphere

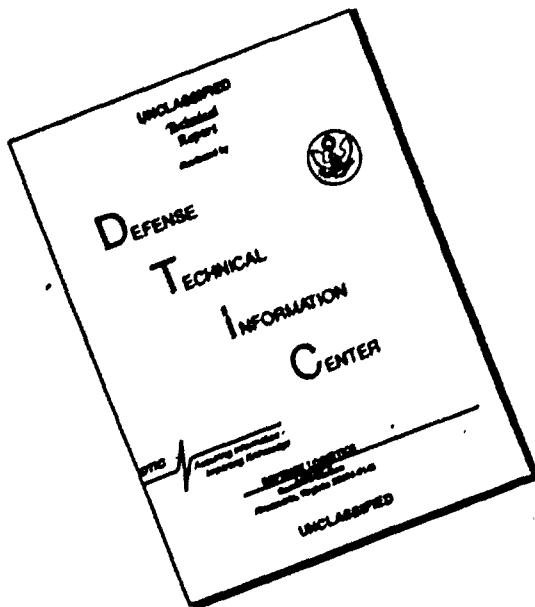
Height (km) Std Dev (Grah)
Vector Std Dev (m)

October

200 mb



DISCLAIMER NOTICE



**THIS DOCUMENT IS BEST
QUALITY AVAILABLE. THE COPY
FURNISHED TO DTIC CONTAINED
A SIGNIFICANT NUMBER OF
PAGES WHICH DO NOT
REPRODUCE LEGIBLY.**